DEGRADABLE SIX-PACK RINGS

JOINT HEARING

BEFORE THE

SUBCOMMITTEE ON FISHERIES AND WILDLIFE CONSERVATION AND THE ENVIRONMENT

OF THE

COMMITTEE ON MERCHANT MARINE AND FISHERIES

AND THE

SUBCOMMITTEE ON TRANSPORTATION, TOURISM, AND HAZARDOUS MATERIALS

OF THE

COMMITTEE ON ENERGY AND COMMERCE HOUSE OF REPRESENTATIVES

ONE HUNDREDTH CONGRESS

SECOND SESSION

ON

S. 1986

A BILL TO STUDY, CONTROL, AND REDUCE THE POLLUTION OF AQUATIC ENVIRONMENTS FROM PLASTIC MATERIALS, AND FOR OTHER PURPOSES

JULY 26, 1988

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DEGRADABLE SIX-PACK RINGS

TUESDAY, JULY 26, 1988

HOUSE OF REPRESENTATIVES, SUBCOMMITTEE ON FISHERIES AND WILDLIFE CONSERVATION AND THE ENVIRONMENT, COMMITTEE ON MERCHANT MARINE AND FISHERIES, JOINT WITH SUBCOMMITTEE ON TRANSPORTATION, TOURISM, AND HAZARDOUS MATERIALS, COMMITTEE ON ENERGY AND COMMERCE,

Washington, DC.

The subcommittees met, pursuant to call, at 2:30 p.m., in room 1334, Longworth House Office Building, Hon. Gerry E. Studds (chairman of the Subcommittee on Fisheries and Wildlife Conservation and the Environment) presiding.

Members present: Representatives Studds, Luken, Whittaker, Hughes, and Miller.

Staff present: Gina DeFerrari, Jeff Pike, Will Stelle, Lisa Murray, Tom Melius, Sue Waldron, and Jim McCallum, from the Committee on Merchant Marine and Fisheries, and David Colbert, Melodie Pickett and Jan Edelstein, from the Subcommittee on Transportation, Tourism, and Hazardous Materials, Committee on Energy and Commerce.

STATEMENT OF HON. GERRY E. STUDDS, A U.S. REPRESENTATIVE FROM MASSACHUSETTS, AND CHAIRMAN, SUBCOMMITTEE ON FISHERIES AND WILDLIFE CONSERVATION AND THE ENVIRONMENT

Mr. STUDDS. The Fish and Wildlife Subcommittee joins today with the Hazardous Materials Subcommittee for a hearing on—appropriately enough—material that is hazardous to fish and wildlife—the plastic six-pack ring. Presiding with me today is the Honorable Tom Luken, co-chair of this august ad hoc gathering. To my colleague from Ohio and to the other members of the Hazardous Materials Subcommittee, I extend our welcome and thanks for their participation.

The six-pack ring epitomizes the plastic pollution problem: a highly successful product that is functional and durable, and yet ugly and deadly when improperly discarded. Familiar are the news articles on plastic pollution that picture a sea gull or seal that has ensnarled itself in one of the holes of a six-pack ring—a lethal and avoidable necklace for our marine life.

Our Subcommittee approved legislation last year—now law—that seeks to address the overall problem of plastic pollution of the marine environment. It implements into U.S. domestic law the requirements of Annex V to MARPOL, regulating the disposal of all plastic from ships. It also requires Environmental Protection

Agency and NOAA to conduct several studies on plastic pollution and identify steps that can be taken to further reduce the amount of plastic trash that ends up fouling our shorelines and destroying our marine life.

The legislation before us today targets one specific aspect of the problem—plastic six-pack rings—and directs Environmental Protection Agency to require manufacturers to shift to more benign degradable products. I hope today to hear from witnesses about their views on the seriousness of the problem this legislation attempts to solve, and the extent to which this legislation will solve it. It is my pleasure to recognize the distinguished gentleman from Ohio, Mr. Luken.

STATEMENT OF HON. THOMAS A. LUKEN, A U.S. REPRESENTATIVE FROM OHIO, AND CHAIRMAN, SUBCOMMITTEE ON TRANSPORTATION, TOURISM, AND HAZARDOUS MATERIALS

Mr. LUKEN. Thank you, Mr. Studds. I am very pleased to be able to join my colleague, the gentleman from Massachusetts, to explore the question of whether six-pack rings should be required to be made of a degradable plastic. The use of such plastic six-pack rings is widespread. They can be found in groceries and homes throughout the country. Unfortunately, as the gentleman has just stated, they also may turn up in our waters, where they can kill or otherwise debilitate fish and other wildlife which become hopelessly entangled.

Sixteen states have already seen fit to require that rings be degradable. While there may be reason to question the need for congressional action where states are already taking the lead, I certainly believe the proposal before us today symbolizes the concern for our nation and its wildlife.

I would like to note a few concerns about the legislation and the problems before us today. This bill appears to be a worthy but narrowly focused measure. Even if our respective committees conclude that legislation is appropriate, we should guard against the illusion that this is a major stride towards solving our country's increasingly serious problems with waste. Discarded plastics account for a relatively small portion of the 160 million tons of municipal waste which Americans generate annually. Ring carriers are an almost negligible part of this major waste stream.

The solution to the 160 million ton problem will have to involve more than degradability of a few select items. Rather, communities need the flexibility to taylor the various options, such as recycling, incineration, source reduction, and landfilling, to meet their particular needs.

For instance, one of the threshold questions for communities which have begun long range waste management planning is how to dispose of incinerator ash. These are some of the problems we are dealing with in an ongoing way, and of which this is a relatively small, but certainly very critical part. Therefore, my final concern is that if we pass this bill some parties may try to read more into it than is intended, it is designed to solve a specific wildlife problem, not a waste problem.

For that reason, Mr. Studds, I congratulate you for your initiative in bringing up this matter, and we are pleased to become a part of it, and will look forward to the testimony with anticipation.

Mr. STUDDS. I thank the gentleman.

It is my pleasure to yield to a person we don't have many of on the Fishery Subcommittee, the gentleman from Kansas.

STATEMENT OF HON. BOB WHITTAKER, A U.S. REPRESENTATIVE FROM KANSAS

Mr. WHITTAKER. Thank you Mr. Chairman.

I would like to commend you and Chairman Luken for scheduling today's hearings. It is clear additional action is needed to reduce the adverse environmental effects caused by the ever increasing amount of plastic wastes that the nation generates. Last year, we passed legislation directing the Environmental Protection Agency to study ways to improve the regulation of plastic wastes. I look forward to hearing just how that study is actually progressing. While I am generally supportive of new efforts aimed at correcting problems caused by plastic debris, I do have some concerns with Senate bill 1986.

If we consider a new legislative response, it seems to me a two pronged approach might be desirable. We must both reduce the amount of plastic debris in our environment, and encourage changes to the physical characteristics of the plastic products that might end up in the environment. Today we will hear testimony on a bill that implements just the second prong, for only one type of plastic debris. It would mandate a change in the physical properties of plastic holders for bottles and cans.

Accordingly, I have several concerns with Senate bill 1986. For example, I wonder how the bill fits in with what the Environmental Protection Agency is finding in its study.

Secondly, I wonder whether the bill is too narrow a legislative response.

Thirdly, and I think most important, I wonder about the comparative environmental risks of the current plastic holders and the degradable holders.

I stand ready to support legislation that will produce real environmental improvements regarding plastic waste. I look forward to hearing the opinions of today's witnesses regarding Senate bill 1986.

Thank you.

Mr. STUDDS. I thank the gentleman.

We will proceed with all our witnesses in a single panel. Five people. I understand you are going to proceed in the order in which you appear on the list and you have humanely agreed to confine your oral presentation to no more than five minutes each. Your written statements will appear in their entirety in the record and we will begin with Ms. Sylvia Lowrance.

Mr. STUDDS. Ms. Lowrance.

STATEMENT OF SYLVIA LOWRANCE, DIRECTOR, OFFICE OF SOLID WASTE, ENVIRONMENTAL PROTECTION AGENCY, ACCOMPANIED BY TUDOR DAVIES, DIRECTOR, OFFICE OF MARINE AND ESTUARINE PROTECTION

Ms. LOWRANCE. Thank you.

The Office of Solid Waste has national responsibility for implementing statutory and regulatory requirements relating to solid waste—both hazardous and non-hazardous. With me today is Tudor Davies, Director of the Office of Marine and Estuarine Protection. Mr. Davies' office has responsibility for certain aspects of solid waste management as they impact the marine environment.

I am pleased to have the opportunity to report to you on the implementation to date of Section 2202 of the Plastic Pollution Research and Control Act and to discuss the views of the Environmental Protection Agency on S. 1986. Issues relating to plastic wastes are part of a larger solid waste problem in the states. Much of the plastic debris that finds its way to our beaches and our oceans is actually part of the nation's municipal solid waste stream which has been improperly disposed of.

In 1986 the United States produced approximately 158 million tons of municipal solid waste. Plastics composed seven percent or ten million tons of that total. Our current projections are that by the year 2000 we will produce 16 million tons annually. That will represent a 60 percent increase in plastic waste.

Current solid waste management practices result in landfilling of approximately 80 percent of our municipal wastes. Recycling is at about ten percent, with the remaining ten percent being incinerated. The increasing volume of waste, coupled with the resistance to siting new landfills, and the reduced capacity in existing landfills, has led some parts of the nation to a near crisis situation with regard to disposal of their garbage. One-third of the nation's landfills will reach capacity by 1992.

Next month, Environmental Protection Agency plans to publish a draft proposed agenda for action on municipal solid waste management. The proposed agenda is going to stress the need for an integrated approach to solid waste management. This will include a combination of management elements, including source reduction and recycling, and reuse, tailored to the particular needs of each community, and it will reduce reliance on disposal options such as landfilling and incineration.

Plastic wastes are one important consideration in the development and implementation of a community's solid waste management program. The report to Congress we are now preparing in response to section 2202 will provide important information to ensure that an overall plastic strategy can be developed. We will submit that report to Congress as scheduled, by July of next year.

Among the things that we will include in that report will be an assessment of the degradability of plastic products. The report will build on the work already completed of the Inter-Agency Task Force on Persistent Marine Debris. That report made several recommendations, and I would like to call your attention to one in particular. That is the recommendation that indicates a need for additional information with regard to degradable plastics.

The task force concluded that significant data gaps exist with regard to our knowledge of deterioration of plastics in the marine environment, and particularly of the technologies which may potentially be applied to plastic ring carriers. It stated we need a better understanding of the effectiveness of the technology at sea under various climatic conditions and the nature and rates of release of degradation products in the environment.

These and other questions are going to continue to be considered as we pursue completion of Environmental Protection Agency's report to Congress in Environmental Protection Agency as well as being done by the Commerce Department.

As to S. 1986, it does express the desire of Congress to prevent harm to fish and wildlife and to reduce litter by requiring that plastic ring carrier devices be made of degradable materials. Environmental Protection Agency strongly supports the underlying intent of this bill, but we do believe that at this time, we should, first, develop a comprehensive strategy for dealing with all plastics, and we should also assess the technical and scientific use that their disposal raises.

In addition to the threat to Marine and other animals, Environmental Protection Agency is also concerned about the effects of improper disposal of all plastics on coastal and other communities in the form of litter. We are very much aware that our marine and coastal resources are very important for a variety of reasons. By 1990 approximately 75 percent of our citizens will live within 50 miles of a coastline. As we approach this issue, we believe we need to carefully consider the issue of risks of degradation products as well as risks from product substitutes that may occur in the face of a regulation, to make sure that our solution is a comprehensive and effective one.

In addition, in the interim, we can work to analyze the effects, both intended and unintended, of laws and policies similar to S. 1986 that have been enacted at the state level. We can gain valuable knowledge through assessing these state programs.

That concludes my prepared remarks.

Mr. STUDDS. Thank you very much.

[The statement of Ms. Lowrance can be found at end of hearing.]

Mr. STUDDS. Next, we will hear from Mr. Robert Smith.

STATEMENT OF ROBERT SMITH, DEPUTY ASSISTANT DIRECTOR FOR FISH AND WILDLIFE ENHANCEMENT, U.S. FISH AND WILDLIFE SERVICE, ACCOMPANIED BY JOHN BLANKENSHIP, CHIEF, DIVISION OF ENVIRONMENTAL CONTAMINANTS

Mr. SMITH. Thank you, Mr. Chairman. It is a pleasure for me to be here to testify on S. 1986, a bill which would require that plastic six-pack rings be degradable after their intended use. Accompanying me today is Mr. John Blankenship, Chief of the Service's Division of Environmental Contaminants. Our written testimony has been submitted for the record.

Your letter of invitation indicated a special interest in any information that the Service may have on the impacts of these six-pack devices to fish and wildlife health. To this end, I conducted an informal telephone survey of our coastal refuges, as well as several

along with a number of photographs of species affected by plastic six-pack rings, are being circulated now for your information.

Most refuges contacted during the survey reported at least one instance of entanglement over a specific observation period. Refuge personnel characterized six-pack ring entanglements as occasional, affecting individual animals rather than wildlife populations. However, when animals were observed in one of these devices, there was little doubt as to cause and effect—with death or injury often being the final outcome.

As you can see from the photographs, six-pack yokes can act like rigid pieces of netting, occasionally snaring wildlife in one or more mesh openings. It appears that birds most often encounter problems with these rings, particularly gulls. Gulls often wind up with the ring around the bill, much like a bridle on a horse. The same result has been observed in ducks and wading birds, and the result is death due to struggling or starvation. For birds which simply carry the six-pack yokes around their necks, impacts may be prolonged or less severe.

The Administration has moved to address the problem of persistent plastic debris in the environment. As you are aware, an Interagency Task Force was formed in 1987 by the White House Domestic Policy Council to study the issue of persistent marine debris. Its charge was to "assess the problem and the need for research, identify potential research issues, and consider alternative action to address the problem of plastic marine pollution."

This report contained five major recommendations to address the persistent debris issue, including:

(1) Establishment of a leadership role for the Federal Government with strong involvement from State and local governments.

(2) Development of comprehensive educational materials on problems caused by marine debris and ways to solve them.

(3) Implementation of all laws related to marine debris.

(4) Sponsoring research to identify and quantify, among other things, effects of marine debris on fish and wildlife, as well as effects of byproducts of degradable plastic products; and

(5) Federal promotion of beach cleanup and monitoring.

Particularly relevant to this bill is the fact that the recent task force report specified that Federal agencies need to evaluate what happens to the plastic in the marine environment as manufacturers begin producing photo and bio-degradable products. For instance, will the plastic sink, break up, or dissolve?

If algae grows on it, will degradation slow?

Is microbial action necessary for degradation?

Will plastic products emit toxic substances as degradation occurs?

Are there potential impacts when degradable plastics are disposed of in landfills?

The report concluded that we need to determine answers to these and many other questions before we require that specific products be degradable solely on the basis of the problems that they cause as marine debris.

I would also like to point out that the Service is not aware of any comprehensive studies regarding the toxicity of products from degradable plastics to fish and wildlife.

Other questions related to wildlife resources should be answered prior to moving ahead with this bill. For example, will the degradable yokes be likely to absorb food odors and therefore be attractive to some species of wildlife as some field biologists suspect with the present yokes?

Finally, what are the likely substitutes for six-pack yokes that may spring from a regulated industry, and what are the effects of these devices to fish and wildlife resources? For instance, if shrink wrap were substituted for six-pack yokes, would more sea turtle deaths be traded for fewer sea bird entanglements?

In summary, the Service believes that the five major recommendations in the task force report should be implemented prior to any action on this bill. Implementation of the recommendations will serve to answer many of the questions the Service has regarding possible impacts of this proposed legislation on fish and wildlife, as well as possibly providing some broad based solutions to the general problem of plastic debris in the environment.

This concludes my testimony. I will attempt to answer any questions you may have regarding the impacts of this proposed legislation on fish and wildlife resources.

Mr. STUDDS. Thank you.

[The statement of Mr. Smith can be found at end of hearing.]

Mr. STUDDS. We will go now to Mr. Mike Hudson, Vice President of Public Affairs, Illinois Tool Works.

STATEMENT OF MIKE HUDSON, VICE PRESIDENT OF PUBLIC AFFAIRS, ILLINOIS TOOL WORKS

Mr. HUDSON. Thank you, Mr. Chairman.

We did prepare material in advance, which you did receive. In addition to our written statement, we did provide a brochure which goes into fairly detailed background about the process of degradable plastic as we use it for our Hi-Cone six pack carriers, which is a trade name. We developed the carrier back in the late 1960s patented it and marketed it. We are one of the two manufacturers, the other being Owens-Illinois, based in Toledo, Ohio.

Also, attached to our information are a chronological list of the states—which are now 17—that have actually passed the law. The date they become effective.

We also indicated exactly what devices these various states regulate under their legislation, and finally, there is a map that not only shows these states, but lists an additional eight states where we anticipate possible legislative activity in the next session of the state legislature.

Very quickly, to keep to the five minutes, Illinois Tool Works developed the plastic six pack carrier, which we patented under the name of Hi-Cone, for the marketplace of people who wanted to multi-pack their products in cans, primarily the soft drink and brewing industries.

Since that time, the product has enjoyed a great deal of success in the 20 to 25 years that it has been there. However, successful as

it is, it is not without its competition. Most of you are familiar with one type of competition, which is the coated paper board type, to carry cans. Some of these coatings include—like this one happens to—in addition to paper board carriers, a thin film of plastic, because they needed to make it moisture resistant to be able to pack it on the canning lines.

Another type of competition we have is shrink film, which has already been alluded to. A plastic device which wraps around the cans. Those are two of our competitors.

We continue to function well in the marketplace. One of the reasons that the carrier has been so successful—here is an example of a degraded carrier that was out about a month—in May and June—in Chicago—is its light weight unique design and speed of application.

One of the reasons the customers have adopted our product is because of its light weight and relative lack of material. So we think already the carrier in and of itself, is making a major contribution right now to reducing the amount of solid waste that stems from packaging, particularly of beverage cans.

ITW did not jump at this idea of degradable plastic quickly. We did a lot of investigation and looked at a variety of different kinds of systems during the 1970s before we decided to go with what we now call our photo-degradable ECO carrier. We actually tested and produced the product and knew it would work through the commercial environment prior to the passage of the first state law which was the State of Vermont, in 1976, and became effective January of 1977.

As was mentioned, since that time, now an additional 17 states have come on stream with requirements for degradable carriers. I think it is of interest, particularly to members of this committee, about how the product would perform in the marine environment, and there are studies which are mentioned in my testimony that indicate because the carrier is basically made out of low density polyethylene plastic, and has a specific draft less than water, it will float. If it is floating, it can be exposed to the sunlight, which is where the UV light that causes the photo-degradation to take place. So if it is floating, the sunlight will attack it and the carrier will become brittle and will eventually go away.

The time frames do vary, because the amount of sunlight varies both from latitude to latitude, as well from summer to winter to spring. Generally speaking, under normal exposure patterns, you should be talking about several weeks in the summertime to several months in the wintertime, again, depending on the location where you are located.

I mentioned the states that have passed it and pointed out we do have competition, and that raises one of our concerns about the current draft of this legislation. Only one product is required to be degradable on a national basis whereas there are other types of packaging that do exist in the marketplace and, like our product, are occasionally and unfortunately littered by thoughtless people, and do end up along the beaches, as well as the parking lots, et cetera.

So all three products do end up as litter. Ours is required to be degradable, the others aren't. That is not as consistent with a

number of state laws that have come on stream that have a broader definition.

Our final concern is one of perhaps more intent but S. 1986 as drafted could be interpreted to say that you can only make degradable carriers. We do make in our three or four domestic manufacturing operations, carriers for the export market. All of the carriers we sell to Canada, Latin America, and the Far East are made at our manufacturing facilities in the United States. Those countries do not require either by law or at this point, even custom, degradable carriers. We would be concerned if we could not continue to supply them with non-degradable carriers. They might turn to alternate forms of packaging, and we would lose that export market. Those are our concerns.

Thank you very much.

[The statement of Mr. Hudson can be found at end of hearing.]

Mr. STUDDS. Next is Dr. Al Manville, Senior Staff Wildlife Biologist, Defenders of Wildlife.

STATEMENT OF AL MANVILLE, SENIOR STAFF WILDLIFE BIOLOGIST, DEFENDERS OF WILDLIFE

Mr. MANVILLE. Thank you.

I am presenting this testimony today on behalf of 29 of the groups in the Entanglement Network Coalition which I chair. I also might mention the California Marine Mammal Center and Greenpeace will probably sign onto this testimony, but haven't had a chance to read it yet [both subsequently signed on]. The Network, by the way, is a consortium of some 38 environmental, conservation, and animal welfare organizations, which attempts to serve as the unified voice of the environmental community concerning entanglement, incidental take, and plastic ingestion.

In lieu of my time constraints let me get right into my oral statement here. I just returned last night from Alaska. In fact, the temperature difference is quite a change. It was 45 in Anchorage yesterday. I have been out on the Aleutian Islands for the last ten days aboard the Fish and Wildlife Service's 120-foot research vessel, the *Tiglax*. The intent of this trip was to look at the Near Islands, which are actually the outermost islands in our territory, that have problems with plastic beach pollution.

I conducted 25 beach surveys on islands including Attu. Attu, for those of you not familiar with its location, is 1,600 miles west-southwest of Anchorage, farthest out of our Aleutian Islands. In the Aleutians, Attu, Agattu, Shemya, Buldir, Kiska, Little Kiska, and Adak islands were the islands I conducted beach surveys on.

One thing that astounded me was the absolutely tremendous quantity of plastic on all these beaches where I conducted surveys. Some were in protected areas, others were facing ocean and current fronts, but plastic problems were phenomenal. Their sources were probably ship-borne, platform, or land-based. It was difficult to tell.

I identified materials from Japan, Korea, Mainland China, Taiwan, Russia, Norway and the United States. Let me give you a sample of my findings. On the western-most beach on Attu Island, which again is about 1,600 miles west-southwest of Anchorage, our

farthest out island, I conducted a one-hundred-yard beach survey. As we were coming ashore on a Zodiak from the *Tiglax,* the first thing I saw were 13 bull Steller's sea lions. One of them was resting on a plastic buoy. Another was sleeping on a trawl net on the beach—plastic all over the beach.

Quickly I will give you an overview of what we found here: 1 beer crate, 4 green bottles, 29 other bottles, 47 plastic buoys, 7 plastic caps, 3 plates, 1 brush, 3 disposable lighters, 3 National Marine Fishery Service drift cards, 120 fish nets, most of which were trawl nets, 1 garbage can lid, 1 glove, 2 hard hats, 9 laundry baskets, 1 life ring, 170 pieces of rope, 1 piece of PVC pipe, 3 shoes, 7 large pieces of sheeting, 7 pieces of packaging, 9 strapping bands, 2 toothbrushes, 1 dish washer sprayer, 3 container tops, 80 styrofoam buoys, 9 pieces of plastic and parts of 2 coolers. Now, on this particular beach I did not find any six-pack beverage yokes, but I did collect samples from three other beaches, one, interestingly being a HI-Cone degradable plastic beverage yoke. So the problem is that there's a tremendous amount of plastic on those beaches.

I was also asked to attempt to identify problems with plastic as far as their impacts on wildlife were concerned. I did photo-document a bull Steller's sea lion with an entanglement scar on its neck. It was probably not caused by a six-pack yoke, but more likely by a strapping band. My photographs are not back yet from the developer, so we brought these along as examples. One is a juvenile California sea lion. These were Steller's sea lions on the Aleution Islands, larger than the California species, but indicative of the problem.

The other one is a Canada goose. Out there in the Aleutians they have the endangered Aleutian Canada goose. There were also reports of two other sea lions with entanglement scars on Kiska Island, but we weren't able to locate these.

I found hundreds of sea birds dead on the beach, several wrapped in plastic, but it is difficult to tell whether the plastic was indeed the cause of their demise. But plastic is indeed a problem.

Just to give you an overview of the complexity and diversity of species out there, there were 26 species of seabirds. We saw about 4,300 sea lions, sperm and minke whales, Dall's porpoises, harbor seals, Northern fur seals, and sea otter. We found the body of a beached Steineger's beaked whale but cause of its demise is unknown.

One disturbing trend we noted in the Western Aleutian Islands that has been reported in the Eastern Aleutian Islands as well, was the decline in population of the Steller's sea lion. 1979 surveys conducted by the Fish and Wildlife Service on northern and western Attu Island resulted in an estimate of about 5,700 sea lions. We conducted a survey the same time of the year, using the same techniques this last July 14th and our result indicated only 811 estimated sea lions located. So there has been a decline in the population and I surmise that plastics likely are playing a role in that demise.

We hope passage of this legislation will send a message not only to the plastics' industry, but to product users and the general public that Congress does consider degradability a viable option. I realize, of course, we are targeting one product here but even

though much of the reference to its problem is anecdotal, it does in cases such as this, cause a serious problem to fish and wildlife and we feel it is a good area to target.

I might even mention our research vessel became entangled in a derelict crab plastic trap line while we were out there, and we had to stop the boat and back it up and become disentangled before the line tied up in the propellers.

In conclusion, Mr. Chairman, it is therefore time degradability in plastics becomes one of the options to be seriously dealt with in dealing with this problem. With that, I thank you for the time and appreciate the opportunity to testify.

Mr. STUDDS. Thank you very much, sir.

[The statement of Mr. Manville can be found at end of hearing.]

Mr. STUDDS. Mr. Patrick Toner, Director of Technical and Regulatory Affairs, Society of the Plastics Industry.

STATEMENT OF PATRICK H. TONER, DIRECTOR OF TECHNICAL AND REGULATORY AFFAIRS, SOCIETY OF THE PLASTICS INDUSTRY

Mr. TONER. Thank you, Mr. Chairman.

The Society of Plastics Industry welcomes this opportunity to present its views on degradable plastics. Plastic products have been chosen by the marketplace because of their specific and in some cases, unique physical and chemical properties, overall design and performance characteristics, and economics. The imposition of an additional requirement or expectation, such as degradability should not be made without considering the impact it would have on the other factors which led to the choice of a plastic product in the first place.

I would like to note that Mr. Hudson can speak about the particular bill that is being considered because it is directed toward his particular product. My remarks will generally cover the broader aspects of degradable plastics.

As noted in earlier comments, little is known about the ultimate fate of products which degrade in the environment, but that is not only true of plastics, that is true of a lot of the solid waste stream.

In 1987 about two-thirds of the 50 billion pounds of plastic sold in the United States were converted to long life application in transportation, construction, furnishings and other similar applications. Some of these long life applications are potential markets for plastics which have been recycled out of the post-consumers' solid waste stream.

The remaining 33 percent, which were utilized in packaging and other short life uses, are those which are most thought of when considering degradable plastics. In most cases, the choice of a plastic used for a particular application is dictated by the applicant's requirements. For example, PVC is used for blood bags because of its oxygen barrier properties and compatibility with its precious contents.

PET, another plastic, is used in boil in the bag pouches because of its barrier properties and higher service temperature performance.

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In food packaging applications, plastic is the product of choice for food contact because of its inertness and compatibility with foodstuffs.

A good deal of research has been directed and is still being directed, towards developing plastics with enhanced degradability. These research efforts followed either of two paths. One was to increase the susceptibility to ultraviolet light. The other was to make the plastic biodegradable.

At last three techniques for increasing the ultraviolet light susceptibility of plastics have been developed, one of which is used to make the photodegradable ring carrier. In fact, that technology is specific to that particular resin for that use. All of these technologies have been applied primarily, but not solely, to film grade plastics.

Research on biodegradable plastics has focused on the use of starch as the biodegradable component. However, one novel approach to manufacturing biodegradable plastics has been the development of a copolymer based on a fermentation product of mixed sugar and fatty acids. These copolymers are extremely expensive relative to commodity plastics and are definitely still in the developmental stage.

All these developments do not necessarily promise that the age of degradable plastics is around the corner.

In our testimony, we also note the report of the Interagency Task Force on Persistent Marine Debris. In addition to the questions already enumerated, there was one that the task force also identified, and that problem has also been identified by the American Society for Testing and Materials. That is, there are no methods, agreed upon methods, to evaluate the degradability of plastic products, so there is no target to shoot for.

I would also like to note, as Mr. Hudson did earlier, that there are no standards for evaluating the degradability of any products. If degradability is deemed to be a desirable attribute, then all products should be evaluated for degradable performance.

In addition to the questions identified by the Interagency Task Force on Persistent Marine Debris, a recently published study by the Congressional Research Service identified essentially the same laundry list of questions for further research.

In conclusion, we would like to note that the use of degradable plastics should be considered only if such use contributes to a practical, environmentally sound solution to the problem being addressed. For example, photodegradation does respond, at least partially, to the problems encountered when a product is littered. However, the rate of degradation is highly dependent on the amount of ultraviolet light the product receives. Therefore, the rate is seasonal, and geographically dependent, as Mr. Hudson has already noted.

In the same manner, biodegradable materials may address litter, but it is not at all clear what role these materials should play, if any, in an integrated solid waste management system. Many materials regarded as degradable deteriorate either slowly or not at all.

For example, studies of solid waste composition conducted for the Environmental Protection Agency indicate that over 60 percent of

the materials currently being landfilled would be considered to be degradable, yet there is a landfill shortage.

Recycling or the recovery of the fuel value through waste to energy systems would appear to be more beneficial solid waste management techniques for plastics.

In summary, it is clear that interest in developing degradable plastic products has been rekindled. Degradable plastic products will find their niche in satisfying appropriate environmental and marketplace needs. Our industry is one that has thrived on product innovation and degradable plastics has been a product innovation. However, SPI believes more product development performance evaluation and environmental studies must be completed before major strides can be taken.

Thank you.

Mr. STUDDS. Thank you very much, sir.

[The statement of Mr. Toner can be found at end of hearing.]

Mr. STUDDS. As I listened to especially those of you who have expressed reservations or questions about the legislation, setting aside the almost philosophical general observation that this is an attack or proposed attack on one relatively small part of a much greater problem, which is true and self evident, but leaving that aside as a potential reservation for the moment, what I think I hear those of you who have expressed reservations saying generally is we don't yet know enough about the effects on the environment of the residue or the fragments of biodegradable, or photodegradable plastics, and raising at least the possibility that we may be solving one problem only to create another in the process.

Assuming that is a fair, although oversimplified summary of the most serious substantive questions raised, to anybody on the panel, what do we know about the effects on the environment of currently degradable materials such as you were talking about there a moment ago?

How far does the degrading process go? Does it end up in dust, in small particles? What happens?

Mr. HUDSON. Again, as long as there is exposure it would go first to smaller and smaller particles, and then to dust, and eventually back to its basic element, which would be carbon and hydrogen.

Mr. STUDDS. What do we know about it in the process of that?

Mr. HUDSON. Maybe Pat could answer that.

Mr. TONER. If I may, not to bore you with the technical details, but the principle of the degradation process is to reduce the length of the molecular chain of the plastic resin. Almost all of the packaging materials that we might consider for degradable plastic technology are also largely used for food contact items. Through feeding studies these materials have been deemed to be acceptable for ingestion. All we are doing in a degradation process is reducing the length of that chain to the point where they lose their physical integrity and then they might further degrade to smaller and smaller articles, but would still have some substantial molecular structure similar to that of the original material, which had been cleared for food contact use.

So, while it is unknown exactly what the fate is and the potential toxicity, I don't wish our concerns about environmental fate of the material to give the false impression that we have any reason

to believe we are creating terribly toxic materials. I think our intuition is they are benign, but it is unknown.

Mr. STUDDS. Mr. Hudson.

Mr. HUDSON. I was going to say we use low density polyethylene. As Pat has mentioned, we also have used, with outside laboratories, conducted feeding tests with animals, et cetera, and determine that there is no toxic effect of the low density polyethylene. We really just modify the low density polyethylene and low density polyethylene is not harmful or toxic. There is lots of documentation on this. (It is very difficult to say that if the carrier is benign; then as it degrades into smaller pieces, that it would continue to be benign as opposed to toxic.)

Mr. STUDDS. Was that not some of the substances of Environmental Protection Agency's wildlife's hesitancy.

Ms. LOWRANCE. Yes. Part of the overall plastic report we are preparing for the Congress for next June, one of the issues that is emerging is the new formulas that are being used for plastics. Quite frankly industry, in response to the growing concern about plastics in landfills, as well as in the oceans, has really taken the initiative to develop new products.

We still think that we need to take an additional look at what substitutes are being used in all of these products that people are considering putting on the market to substitute for the previous products, and determine what the substitutes are, and the products of degradation as well as their fate and transport and their potential toxicity.

We believe there is some research that is being initiated now, and we are trying to canvas the Federal Government, industry, and academia to determine where all of that research stands at this time.

Mr. STUDDS. Is it fair to say your hesitancy in endorsing this legislation stems from the fear of at least the possibility we would be replacing one problem with another?

Ms. LOWRANCE. Yes sir. I believe it is twofold. It is the potential of replacing one problem with another, as well as the efficiency of whether this particular solution will truly solve the problem that it is designed to address.

I think one of our witnesses alluded to the fact that these plastic six-pack rings, even the ones on the market today, can exist for one, two, potentially three months, depending on the climatic conditions and the environmental setting. During that time, there can be harm caused to wildlife that may come in contact.

Mr. STUDDS. You have heard the plastics folks tell you that it is perfectly safe to eat.

Ms. LOWRANCE. Yes sir, I have, but I still have reservations given the state of our knowledge at this time.

Mr. STUDDS. You don't want them to pass that down the table?

Dr. Manville.

Mr. MANVILLE. Mr. Studds, we in the Network—a number of us—have a concern with the current state of technology of plastics and that is the photodegradable plastic. They are opportunistic, granted. They are probably better than what is available otherwise, but I think we would like to see more research and development into biodegradable plastics.

A number of these problems might be solved by using biodegradable PHVB plastic which I cited in my testimony. Another is corn starch plastic, but to my knowledge it has never been made into plastic six-pack rings.

I am also interested in a product called chitosan-derived plastic made from chitin, which makes up the exoskeletons of your shellfish, which we dispose tremendous quantities of waste each day in this country. Chitosan, when it is produced in biologically pure batches, can be put through a very simple process of cold-rolling with acetic or formic acid, and made into a very strong plastic with a tensile strength of about 20,000 psi.

The problem is like those of the other plastics, it has never been made into plastic six-pack rings. We need to see more testing, and this way if we could make rings such as plastic six-pack rings out of this material, common bacteria would likely be able to break them down very quickly. But again, we haven't reached that stage of the game yet.

Mr. STUDDS. Notwithstanding that reservation, you would urge us to proceed with dispatch with this legislation, is that correct?

Mr. MANVILLE. Yes. The state of the art as it is, even though it is mostly photodegradable plastics, we feel is necessarily better than what is currently available, otherwise because these plastics—some of the stuff I am finding here—will probably last on these beaches for hundreds, perhaps thousands of years before it eventually degrades, with the eminent possibility of wildlife being entangled, ingesting it, whatever, and dying.

Mr. STUDDS. We have some 16 states that already have similar laws to the one we are considering, is that correct? How do you operate with a national product in a national market with that kind of crazy quilt?

Mr. HUDSON. In what respect?

Mr. STUDDS. Well, for instance, do you make things specifically for specific states?

Mr. HUDSON. We have a resin that we use that we supply all the states that require it, and that ranges with Alaska to California right now in terms of climatological conditions and it has to also—we have a concern at the very front end of our productive cycle and a lot of states, particularly in southern climates, a lot of people do put the particular soft drinks outside of stores or service stations, et cetera, and it can be exposed while it is still in the cans. Obviously, it is important to us to maintain package integrity, so what we aim for is something that will hold together for at least a minimum of three days, and we use—because it was one of the first states that came on stream, Southern California, in the summertime.

We blend the resin that would at least give us three days before the cans would drop out of California in the summertime. Then that leaves it to what will happen to it in the wintertime, or in other climates.

Mr. STUDDS. I yield and I will in a moment.

What percentage roughly of the six-pack plastic ring holders we have in the country are degradable approximately?

Mr. HUDSON. Approximately a third and growing a little bit as new states come on stream.

Mr. STUDDS. What happens to the product that is not degradable? If it is illegal in New York and legal in Pennsylvania, how can one do business?

Mr. HUDSON. We supply our customers. Our customers are the actual breweries, and/or the soft drink bottling companies. For those states, we supply them with the degradable carrier for them to sell in that marketplace.

Mr. STUDDS. So the product is made for a particular state. I would think those with a national market, whether they are beer or soft drink, or whoever producers would be craving national uniformity, whichever it was.

Mr. HUDSON. Again, there is a large difference between just the patterns in the beer industry and the soft drink. You still have an awful lot of original and small state marketplaces within the soft drink, more of a national market in beer. But if I could just, because of that product integrity thing I mentioned, it has been brought out about how long it takes it to degrade, I want that understood to be until it is crumbly and no longer recognized as litter.

At the front end of the curve, when we are talking about our concerns of possibly as quickly as three days not being able to hold a can, the entrapment issue is addressed much earlier than most.

Mr. STUDDS. You may be creating an incentive for people to drink more sooner.

Mr. HUDSON. I would assume that would be all right with both our customers and us.

Mr. STUDDS. The co-chair, the gentleman from Ohio.

Mr. LUKEN. I thank the gentleman.

Mr. Smith, I believe you were saying at one point, we don't know enough about the total effects, you don't know enough in order to make a recommendation, that you don't know whether the degradable items will emit toxic substances, or what rate of degradation will occur, whether it will sink, break up, or dissolve, and other objections that you make. But at another point—I think that is very understandable, and credible, and we should take that into consideration.

Another point you say that you can't support S. 1986 because you don't have sufficient information that indicates six-pack yokes are a major threat to wildlife and to fish. What is the totality of information we have and how soon do you think it will be before we will have, or you will have enough information to determine whether or not the six-pack yokes are a major threat? You are saying they may be?

Mr. SMITH. At this point in time, I would say that they probably are not a major threat to wildlife populations.

Mr. LUKEN. You think you have sufficient information to say that?

Mr. SMITH. As you are aware there can always be those rare populations that I am simply not aware of which, for some reason, could be impacted by these devices.

Mr. LUKEN. Well, this is a fairly recent development, these six-pack yokes.

Mr. SMITH. As I understand, the situation, six-pack yokes have been around for 15 or 20 years.

Mr. LUKEN. We have had testimony they may last for hundreds, even thousands of years, so what about the cumulative effect? Have you considered that in saying it is probably not a major threat? Would it be a major threat cumulatively 200 years from now?

Mr. SMITH. I cannot answer that.

Mr. LUKEN. You really are saying you can't answer that when we look into the future rather than saying you basically have enough information to say it is not a major threat.

Mr. SMITH. At this point in time, based on the research that I have done, which admittedly is fairly cursory, it doesn't appear that these six-pack devices per se are a major threat to wildlife populations.

Mr. LUKEN. That is why I said when do you think we will have enough information to make up our minds? Because if we are creating a situation that may come home to haunt us or haunt our children, grandchildren and other descendants, we best be looking into getting enough information.

Mr. SMITH. That is a tough question to answer.

Mr. LUKEN. We better be especially prudent.

In another area we are finding we have been very profligate with reference to the environment and the development of nuclear bombs and the manufacturing of nuclear materials, and in the past 40–50 years we have created some terrible situations, because the people at that time, 40 years ago, said "We don't have enough information at this time to determine that it is going to be a problem", and we are now facing hundreds of billions of dollars worth of cleanup and real health problems.

What I am just saying, and I am not trying to harass you or anything, but what I am saying is these are questions that are going to require a great deal of care and foresight.

Mr. SMITH. May I respond, Mr. Chairman?

Mr. LUKEN. Yes.

Mr. SMITH. Given the difficult situations that face fish and wildlife resources these days—problems such as habitat losses and toxic wastes—six-pack rings simply have not been identified as a major priority. As I tried to educate myself on this subject——

Mr. LUKEN. That is what I thought you were saying, if I could interrupt. But it is not a very satisfactory answer. Because if we have got a whole panoply of problems, whole array of problems, we have got to deal with them all if they are going to be serious. We can't just say we are going to deal with some of them.

Did you have something?

Mr. TONER. Yes, if I may, Congressman, to respond——

Mr. LUKEN. Sure. I don't have any special knowledge in this area. I am being somewhat provocative, but really I am very serious about it.

Mr. TONER. The unmodified material has been tested in an accelerated aging test to compare the change in degradation imparted by the technology. While the photodegradable loop connecter may degrade or lose its physical integrity and then not become a threat for entanglement in anywhere from three days to three months, as Mr. Hudson has indicated. In similar accelerated aging conditions,

a loop connecter which has not been modified to be photodegradable will lose its entanglement propensity in about 24 months.

So even if one were to extrapolate and say that is in a laboratory, not really what happens on a beach in Alaska or a beach in the South Sea, it is most unlikely that these rings, even if unmodified, will continue to pose an entanglement threat beyond maybe two or five years, I am guessing, but certainly not hundreds or thousands of years.

Mr. LUKEN. Dr. Manville, do you have any further comment on that?

Mr. MANVILLE. I am not a biochemist, so I don't want to refute that. But I am not going to cop out on you. I think we feel, first, in answer to your earlier question, that, when is sufficient information enough? I guess we feel enough is enough. We have enough data, even perhaps if much of it is anecdotal. It is time to take a step in the direction of degradability and look at it seriously, and this is a good place to start.

As far as the accelerated tests are concerned regarding degradation of non-degradable plastics, I just don't know. I don't put a lot of credence in accelerated lab testing. On these beaches in Alaska, much of the stuff was under debris. It may not get much exposure from the sun, and there is not a lot of sunlight out there anyway if you have ever been out to the Aleutian Islands. It is pretty cloudy most of the year. So this stuff could last for a long time, and the estimates Dr. Tony Andrady from Research Triangle Institute has made indicate that much of this plastic may last hundreds of years. I don't think we really know. I don't particularly want to be around here 100, 200 years from now and say this piece of plastic we put out there in 1988, in 2288 here it is, and it still hasn't degraded. I think we need to take some action to try to deal with the problem. This is the place to do it.

Mr. LUKEN. Mr. Toner?

Mr. TONER. If I may relate a piece of real world—whatever the real world is—experience, on unmodified plastics, which have degraded. I was part of a Texas Beach cleanup on Padre Island several months ago. I had my bag out on the beach collecting plastic items off the beach. There were many plastic bottles which, when I picked them up, fell apart in my hand because they were so full of sand they could not carry their own weight. So plastics will degrade even in the real world.

The caution is how long it had been out there, but certainly not 100 years.

Mr. LUKEN. That brings us to what precautions we ought to take as a society. You are all saying to a certain extent we don't know enough about it. There are indications that some plastic will degrade.

Mr. Hudson, you have indicated that—I think from your testimony—that we ought to be doing something about it, though. You indicated that you place some reliance upon the photodegradability of products that you are working with, right?

Mr. HUDSON. Correct. Before the first state passed legislation, ITW recognized the product could cause problems in the environment and sought a solution which made sense to us to make it photodegradable. So the product was tested and the resin was identi-

fied, and we are using it, had it ready to go before the first piece of legislation.

Mr. LUKEN. Is all of your product now photodegradable?

Mr. HUDSON. No. We make both. We make it for those states required and for certain customers who, because of distribution patterns that was kind of alluded to by Congressman Studds——

Mr. LUKEN. What are the advantages of that product which is not photodegradable over that which is photodegradable?

Mr. HUDSON. They are the same product for all intents and purposes. The difference is cost.

Mr. LUKEN. Cost.

Mr. HUDSON. The degradable resin costs more for us to purchase from our suppliers; therefore, it costs us more to sell it to our customers.

Mr. LUKEN. How much?

Mr. HUDSON. A difference now between six and eight percent of photodegradable over nondegradable.

Mr. LUKEN. It seems as we are advancing in knowledge in both areas and what we know about it and in the science of manufacturing, it would appear we are coming closer to a solution, would you say?

Mr. HUDSON. The cost pattern has gone down as volume has gone up, yes.

Mr. LUKEN. Therefore, there might be a reason for using some legislative prodding toward reaching that solution and certainly some prodding as far as the EPA is concerned and at the other agencies in advancing our knowledge and making prudent decisions.

Ms. Lowrance, you indicated that plastic ring carriers are only a small part of our nation's waste management problems, and I think Mr. Smith said something similar. It appears we are getting more and more reports of plastic refuse in our waters and ending up in the ocean environment. I see Mr. Hughes is here today. I bet he has got something to say about that. I think he should. If he doesn't say anything, I know he has got some things on his mind, being from New Jersey and the areas where there seems to be an increasing number of reports of that buildup of plastic accumulation of refuse in our waters. Can you tell us what EPA is doing in 30 seconds, 60 seconds, with regard to this overall accumulation?

Ms. LOWRANCE. Yes, sir. We in the solid waste program are taking a look at a national agenda that contemplates a real waste management hierarchy, if you will. We think for the entire plastics problem, and given the level of growth in plastics, we need to first look at source reduction, and that is the issue we are addressing today.

In addition, we also need to look at how far we can take recycling of plastic materials. At this point in time, our estimate is only about one percent of plastics are currently being recycled. Most of those are the plastic soft drink bottles.

Mr. LUKEN. I know I asked you an involved question and have run out of time, but does EPA have legislation in mind in any of these areas that you know of or you can cite?

Ms. LOWRANCE. At this point in time, we do not have legislation in mind. We are first taking a look at the full scope of the problem.

As to plastics, in particular, part of our report to Congress that is due to you in June of next year will assess where we stand, how far we can take our current legislation, and whether we would need additional legislative authority to address the whole plastics problem.

Mr. LUKEN. Thank you, Ms. Lowrance. Thank you, Mr. Chairman. I yield back the balance of my time.

Mr. STUDDS. The gentleman from Kansas.

Mr. WHITTAKER. Thank you, Mr. Chairman.

Dr. Toner, in your experience in Alaska and elsewhere, have you found that the six-pack ring holder specifically poses a specific threat to wildlife as compared to other forms of plastic waste in general?

Mr. MANVILLE. I think you meant to refer that to me, sir.

Mr. WHITTAKER. Yes, I did. Sorry.

Mr. MANVILLE. One of the intents of this trip was to try to determine if there were any impacts on wildlife caused by six-pack rings. Now I did find, as I mentioned earlier, three examples of six-pack rings on 25 beach surveys that I conducted. These were surveys of about 100 yards each per beach, but unfortunately was not able to find or document evidence of negative impacts of these actual yokes on wildlife.

As I mentioned earlier, I did find a sea lion that looked like it had a strapping band scar around its neck. There were reports from the Fish and Wildlife Service of scars on two other sea lions on Kiska Islands. We found hundreds of seabirds dead, some wrapped in plastic, but again I don't know if there is a cause and effect relationship and wouldn't want to stick my neck out and say, yes, plastics were the cause of their demise.

In answer to your question, no, I didn't. But I suspect from evidence such as this and some of the examples I gave in my testimony and other examples that have been presented at other times, that they are a bit of a problem—again, not the overall problem—but they are fairly egregious, particularly as has been mentioned earlier in testimony here, their impacts on wildlife and particularly seabirds, because they float. Seabirds—many of them dive, go through them, and they get stuck, so it is a problem.

Mr. WHITTAKER. I am just curious, and it is probably best directed to Mr. Hudson or Mr. Toner, but in terms of making something degradable in a shorter span of time, what is involved with making it so degradable that it does not fulfill its original purpose, such as a ring holder for a six-pack of Coca-Cola, or whatever, that falls apart before the coke is consumed?

Mr. HUDSON. That was our initial concern, the reason we tried several different approaches before we came up with this particular resin and by changing the amount of modifier you add you can either extend or collapse the period. What we have attempted to do is find one resin that satisfied, took into account the various types of climate we would be encountering and yet would still work on the front end, and the advantage of this particular technology, Congressman, is that it has a very—once it starts the curve, goes down very very sharply. But it doesn't start the first few days, if you will; it is kind of stable. But once it starts, the curve goes like that.

For our purpose, keep in mind the products we package with this are primarily intended to have short shelf lives. The Coca-Cola and the beer people do not want their product staying around for long periods of time either, so there is kind of a unique match between this product and the product package.

Mr. WHITTAKER. Can you give us an idea what the approximate cost of a six-pack would be for biodegradable collar versus non?

Mr. HUDSON. Currently, the nondegradable is selling for something, depending on the size of the carrier, between $13 and $15 per thousand, add another six to eight percent surcharge would be what it would be for degradable.

Mr. LUKEN. Would the gentleman yield?

Mr. WHITTAKER. I would be happy to.

Mr. LUKEN. Is the gentleman extending the increase in photodegradable to degradable generally, the increase in price is the same?

Mr. HUDSON. Yes, sir.

Mr. LUKEN. You said before that the increase for photodegradable over the nondegradable was five to six percent.

Mr. HUDSON. Six to eight percent.

Mr. LUKEN. This gentleman's question was degradable, biodegradable.

Mr. HUDSON. I thought he was asking——

Mr. LUKEN. Is it the same, biodegradable or photodegradable?

Mr. SMITH. Photodegradable was what I was referring to.

Mr. HUDSON. We only make photodegradable.

Mr. LUKEN. Thank you. It was my confusion. Thank you.

Mr. WHITTAKER. That works out to be about a penny and a half.

Mr. HUDSON. Something of that nature, yes.

Mr. WHITTAKER. It wouldn't reach even a penny and six-tenths to go to photodegradable, it makes such a small difference.

Mr. HUDSON. Correct.

Mr. WHITTAKER. Thank you.

Mr. STUDDS. We thank you all for your time. You have shown great courage, some of you, in questioning a bill which passed the United States Senate unanimously. These Subcommittees are not going to rule this legislation out on the basis merely because it passed the United States Senate unanimously.

We appreciate it and look forward to working with you in the future.

The Subcommittee stands adjourned.

[Whereupon, at 3:55 p.m., the Subcommittee was adjourned subject to the call of the chair.]

[The following was submitted for the record:]

STATEMENT OF HON. H. JAMES SAXTON, A U.S. REPRESENTATIVE FROM NEW JERSEY

First, I welcome our colleagues from Energy and Commerce, and thank the chairmen of both subcommittees for bringing this issue into the light of a public hearing. As others have mentioned, the bulk of this bill was signed into law by President Reagan in December of 1987—and we should all take pride in that achievement.

On the remaining issue before us today, the 6-pack rings, I, for one, will need no convincing of the damage they can do. They are not just a "potential" threat, but a very real cause of death in birds and marine mammals. I personally have witnessed this. I have seen ducks and geese choked to death by 6-pack rings. Dr. Bob Schoelkopf of the Marine Mammals Stranding Center in Brigantine, New Jersey has shown me direct evidence of deformities in bluefish caused by entranglement in 6-

pack rings and numerous cases of marine mammals deaths from other nondegradable plastics. There is not need to delay any further, the evidence is there.

One caution that I do feel is needed, however, is to make it clear that this is an emergency measure and should in no way be construed to signal that it is now "OK" to drop your 6-pack rings into the ocean. The plastic these rings are made of is recyclable. Hopefully, the Nation will soon follow New Jersey's example in moving to promote the recycling of plastics and other re-usable products.

Again, Mr. Chairmen, my thanks—I look forward to the testimony of today's witnesses.

Opening Statement of
The Honorable Thomas A. Luken
Subcommittee on Transportation, Tourism, and
Hazardous Materials

Joint Hearing with
The Merchant Marines and Fisheries Subcommittee on Fisheries and
Wildlife Conservation and the Environment
On S. 1986 - A bill to study, control, and reduce the pollution
of aquatic environments from plastic materials

July 26, 1988
2:30 p.m.
Room 1334 Longworth House Office Building

I am pleased to be able to join my colleague, the gentleman from Massachusetts, to explore the question of whether six-pack rings should be required to be made of degradable plastic. The use of six-pack rings is widespread - they can be found in grocery stores and homes throughout the country. Unfortunately, these same ring carriers may also turn up in our waters, where they can kill or debilitate fish and other wildlife which become hopelessly entangled.

Sixteen States have already seen fit to require that ring carriers be degradable. These laws appear to be neither disruptive nor costly. While there may be reason to question the need for Congressional action where the States are already taking the lead, I certainly believe that the proposal before us today symbolizes the wholehearted concern of government for our nation's wildlife, a concern which I fully share.

Before yielding my time, I would like to note a few of my concerns about the legislation and the problems before us today. S. 1986 appears to be a worthy, but narrowly focused, bill. Even if our respective Committees conclude that legislation is appropriate, we should guard against the illusion that this is a major stride towards solving our country's increasingly serious problems with waste. Discarded plastics account for a relatively small portion of the 160 million tons of municipal waste which Americans generate annually, and ring-carriers are an almost negligible part of this waste stream.

The solution to this 160 million-ton problem will have to involve much more than the degradability of a few select items. There is no single magic recipe to solve all of our garbage problems. Rather, communities need the flexibility to tailor the various options, such as recycling, incineration, source reduction and landfills, to meet their particular needs.

For instance, one of the threshold questions for communities which have begun long-range waste management planning is how to dispose of incinerator ash. Municipalities are looking to Congress to resolve the uncertainty which contributed to the

embarrassing international journeys of 30,000 tons of ash from Philadelphia incinerators this year - an extended version of last summer's tale of the Flying Dutchman garbage barge from Long Island. To help prevent such recurrences, I have introduced H.R. 4357, a bipartisan bill which would establish environmentally sound requirements for the management of municipal incinerator ash.

So I would stress that S. 1986, which deals with only one very small component of a large and complex waste stream, is not a panacea to the problems of litter and waste.

I am also doubtful that the limited benefits of the bill justify the use of scarce EPA resources to promulgate new regulations. If legislation is adopted, it may be wiser to eliminate the regulatory process and to simply spell out the requirement that plastic ring-carriers must be photo-degradable after a specified date, while still allowing for the use of existing inventories. We should not ask the Agency to engage in yet another decision-making process when it is already evident that photo-degradable plastic is capable of deterioration in the marine environment where plastic-related wildlife problems are occurring.

My final concern is that, if we pass this bill, some parties may try to read more into our decision than is intended. S. 1986 is designed to solve a specific wildlife problem - not a waste problem - which is caused by one particular type of product. It does not herald a new direction in public policy, nor is it meant as an implicit warning to plastics manufacturers. While product degradability may deserve consideration as a limited part of the solution to America's trash problem, that is not the topic of today's discussion.

I look forward to the testimony of the witnesses and hope these hearings will serve to better our understanding of these matters.

I

100TH CONGRESS
2D SESSION

S. 1986

IN THE HOUSE OF REPRESENTATIVES

MAY 17, 1988

Referred to the Committees on Energy and Commerce and Merchant Marine and Fisheries

AN ACT

To study, control, and reduce the pollution of aquatic environments from plastic materials, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

FINDINGS

SECTION 1. The Congress finds that—

(1) plastic ring carrier devices have been found in large quantities in the marine environment;

(2) fish and wildlife have been known to have become entangled in plastic ring carriers;

(3) non-degradable plastic ring carrier devices can remain intact in the marine environment for decades, posing a threat to fish and wildlife; and

(4) eleven States have enacted laws requiring that plastic ring carrier devices be made from degradable material in order to reduce litter and to protect fish and wildlife.

DEFINITIONS

SEC. 2. As used in this Act, the term—

(1) "regulated item" means any plastic ring carrier device which is made, used, or designed for the purpose of packaging, transporting, or carrying multi-packaged cans or bottles, and which is of a size, shape, design, or type capable, when discarded, of becoming entangled with fish or wildlife; and

(2) "naturally degradable material" means a material which, when discarded, will be reduced to environmentally benign subunits under the action of normal environmental forces, such as, among others, biological decomposition, photo-degradation, or hydrolysis.

REGULATION

SEC. 3. Not later than 24 months after the enactment of this Act (unless the Administrator of the Environmental Protection Agency determines that it is not feasible), the Administrator of the Environmental Protection Agency shall require, by regulation, that any regulated item shall be made of naturally degradable material which, when discarded, decomposes within a period established by such regulation. The period within which decomposition must occur after being

discarded shall be the shortest period of time consistent with the intended use of the item and the physical integrity required for such use. Such regulation shall allow a reasonable time for affected parties to come into compliance, including use of existing inventories.

Passed the Senate May 13 (legislative day, May 9), 1988.

Attest: WALTER J. STEWART,

Secretary.

90-333 O - 88 - 3

TESTIMONY OF
SYLVIA K. LOWRANCE
DIRECTOR, OFFICE OF SOLID WASTE
U.S. ENVIRONMENTAL PROTECTION AGENCY
BEFORE THE
SUBCOMMITTEE ON FISHERIES AND WILDLIFE CONSERVATION
AND THE ENVIRONMENT
OF THE
COMMITTEE ON MERCHANT MARINE AND FISHERIES
AND THE
SUBCOMMITTEE ON TRANSPORTATION, TOURISM AND
HAZARDOUS MATERIALS
OF THE
COMMITTEE ON ENERGY AND COMMERCE
U.S. HOUSE OF REPRESENTATIVES

July 26, 1988

Good afternoon, Mr. Chairman and members of the Subcommittees. My name is Sylvia Lowrance, and I am the Director of the Office of Solid Waste, which is concerned with the management of all solid waste. Under the Resource Conservation and Recovery Act (RCRA), the Office of Solid Waste has national responsibility for implementing statutory and regulatory requirements relating to solid waste--both hazardous and non-hazardous. With me today is Tudor Davies, Director of the Office of Marine and Estuarine Protection. Mr. Davies' Office has responsibility for certain aspects of solid waste management as they impact the marine environment.

I am pleased to have the opportunity to report to you on the implementation to date of Section 2202 of the Plastic Pollution Research and Control Act and to discuss the views of the Environmental Protection Agency on S. 1986.

I would like to begin by placing plastic wastes in the context of the overall solid waste picture. Then, I will discuss

our progress on the Report to Congress. Following that discussion, I will address EPA's views on S. 1986.

Plastics as Part of Solid Waste in the U.S.

Issues relating to plastic wastes are one part of a larger solid waste problem in the United States. Much of the plastic debris which finds its way to our beaches and oceans via recreational boats and from other sources is actually a part of the nation's municipal solid waste stream which has been improperly disposed. Therefore, I would like to put plastics in the context of the total municipal solid waste stream for the members of the Subcommittees.

In 1986, the United States produced approximately 158 million tons of municipal waste. Plastics composed 7 percent, or 10 million tons, of that total. Plastic packaging alone accounted for approximately 6 million tons, or 4 percent of the total. By the year 2000, total plastics are expected to rise to 9 percent (16 million tons) with plastic packaging waste comprising a subtotal of 5 percent (8 million tons). This represents a 60 percent increase in plastic waste in the next 14 years. The total volume of municipal solid waste is expected to increase 22 percent and reach 193 million tons per year by that time.

Current solid waste management practices result in landfilling approximately 80% of municipal wastes, recycling 10%, and incinerating the remaining 10% (either with or without energy recovery). The increasing volume of waste, coupled with

resistance to the siting of new landfills and the reduced capacity in existing landfills has led some parts of the nation to a near crisis situation. One-third of the nation's landfills will reach capacity by 1992. As a nation we are being forced to action--forced to begin to accept our individual and collective responsibility for waste generation and management and to address the solid waste problem.

Next month EPA will publish a draft of a proposed agenda for action on municipal solid waste management. The proposed agenda will stress the need for integrated waste management, and will encourage the adoption of a holistic solid waste management plan. This will be a combination of management elements, including source reduction, recycling, and reuse, tailored to the needs of the community which will reduce reliance on disposal options such as landfilling or incineration.

This draft strategy reflects the Agency's judgement that it is preferable, whenever possible, to choose holistic approaches to problem solving. Plastic wastes are one important consideration in the development and implementation of a community's solid waste management strategy. Our preference for holistic approaches extends to the plastics waste problem as well as the development of any regulatory effort.

Report to Congress

The Report to Congress we are now preparing in response to Section 2202 of the 1987 Marine Plastic Pollution Research and Control Act will provide important information to ensure that an

overall plastics strategy can be developed. We will submit the Report to Congress next June. Some of the areas we will be examining in the Report are: various facets of U.S. production of plastics, characteristics of plastic wastes, impacts of plastics on management of the solid waste stream, and evaluation of potential solutions to the overall problem, including source reduction, use of degradable plastics, recycling, and various other potential solutions.

Members of the Subcommittees will be particularly interested in the section of the Report which deals with plastics in the marine environment. This section will consider not only the types and sources of marine debris, but will also consider its environmental fate and effects. In addition, this section will discuss the potential environmental and human health impacts of degradable plastic as well as any economic, behavioral, or institutional barriers to their use and potential ways to remove such barriers.

We have established an interagency work group which includes representatives from the Department of the Navy, the Department of the Treasury, the United States Coast Guard, the Food and Drug Administration, the National Oceanic and Atmospheric Administration, and the National Bureau of Standards. The portion of the Report which deals with degradable plastics will be one of the first portions we develop.

The Report will build on the work of the Interagency Task Force on Persistent Marine Debris. Members of the Committee may

be aware that the Report of the Interagency Task Force on Persistent Marine Debris, issued in May of this year, offered several recommendations. The five primary recommendations include:

(1) Establishment of a leadership role for the Federal government which acknowledges that an effective program is only possible with strong involvement from State and local governments;

(2) Development of comprehensive educational materials on problems caused by marine debris and ways to solve them;

(3) Vigorous implementation of all laws relating to marine debris;

(4) Federally sponsored research to identify and quantify deleterious effects of marine debris on fish and wildlife, coastal communities, and vessels; land-based sources of marine debris; and potential uses for, by-products of, and effects of by-products of degradable plastic products; and

(5) Federal promotion of beach clean-up and monitoring with participation from all levels.

Each of these recommendations has multiple sub-recommendations, which, together, move us in the direction of developing a comprehensive strategy for dealing with plastics in the marine environment. I would particularly draw the Subcommittees' attention to the fourth goal, which indicates our need for additional information about degradable plastics. The Task Force concluded that significant data gaps exist in our

knowledge of deterioration of plastics in the marine environment, and particularly of the technologies which may potentially be applied to plastic ring carriers. We need a better understanding of:

- o the effectiveness of the technology at sea under various climatic conditions;
- o the nature and rates of release of degradation products in the environment; and
- o the extension of the technology to plastic ring carriers.

Some degradable plastics, for example, may not perform as intended when buried in soil or when forced below the surface of water after being covered by algae or seaweed.

These and other questions will continue to be considered in EPA's Report to Congress and the Report to Congress being prepared by the Department of Commerce in response to Section 2203 of the Act. EPA will build on the Interagency Task Force's work and will integrate the work on plastics in the marine environment with the overall solid waste management issues related to management of plastic wastes.

EPA's Views on S. 1986

S. 1986 expresses the desire of Congress to prevent harm to fish and wildlife and to reduce litter by requiring that plastic ring carrier devices be made of degradable materials. It would call for the Administrator to promulgate regulations within 24 months of enactment requiring plastic ring carriers be made of degradable materials. While EPA supports the underlying intent

of S. 1986, the Agency opposes enactment of legislation such as S. 1986 at this time in recognition of the need to develop a comprehensive strategy for dealing with plastics.

In addition to the threat posed to marine and other animals, EPA is concerned about the effects of improper disposal of all plastics on coastal and other communities in the form of litter. We are very much aware that our marine and coastal resources are important for a variety of reasons--ecological, aesthetic, recreational, and economic. By 1990, approximately 75 percent of all the people in the United States will live within 50 miles of a coastline. And those who do not live within 50 miles still benefit--economically, as well as in enjoyment of those national resources during periodic visits. In 1985, for example, the National Park Service recorded 22 million visits just to national seashores.

In addition to sharing the concerns which led to the development of S. 1986, we are also concerned with the generation and environmentally sound management of plastics and other solid wastes all over the country--both in terms of achieving an overall understanding of the problems we face in this area and developing a strategy that deals with the whole problem rather than its parts. Therefore, EPA's preference would be to deal comprehensively with the plastics disposal issue rather than focus solely on the aspects of the problem raised in S. 1986.

When the work currently under way in EPA and other federal agencies is completed to characterize plastics in the waste

stream, evaluate current disposal practices, and determine potential environmental effects of releases or by-products from rapidly degradable plastics and potential substitute products, we will be in a much better position to develop an overall strategy.

Section 2202(b)(6) of the 1987 Marine Plastic Pollution Research and Control Act appropriately requires the Agency to address risks to human health and the environment presented by fragments of degradable plastic articles, as well as the biotoxicity, bioaccumulation, persistence, and environmental fate of end-products of the degradation due to differing environmental and biological conditions. Lacking such data, we would have a very difficult task facing us to determine the necessary technical requirements of regulations which S.1986 would call for EPA to promulgate within 24 months. For example, we would not have adequate knowledge of which materials, if any, are "reduced to environmentally benign subunits" as would be required by the bill.

One potential effect of developing regulations without such information could be to encourage product or materials substitution. Product substitutes we are currently aware of include plastic shrink wrap and paperboard. We do not currently know whether such a substitution would be likely to occur, or what the consequences associated with it would be. For example, we do not know whether known substitutes have preferable end-product characteristics and/or environmental fates when compared to the existing plastic ring carriers. Though use of some

substitutes would reduce strangulation of marine and other animals, it would not eliminate it. Since strangulation can potentially occur immediately upon introduction of plastic ring carriers into the marine environment, any material useful in commerce would be in the environment long enough before it degrades to pose this particular problem. Further, substitution of other plastic materials would not solve the ingestion problem faced by those same animals, nor would it resolve the litter issue which is a nationwide concern.

The availability and desirability of product substitutes and consideration of all improper disposal practices are additional aspects of the Report to Congress we are currently developing in response to the statutory requirements of Section 2202. These very questions which Congress recognized in earlier legislation as important to our understanding of the problem are the ones which we desire to answer before deciding to develop regulations, whether they are narrow or broad in scope. Regulations EPA is called upon to develop under S. 1986 would address one particular aspect of the overall problem. We would prefer, after development and appropriate expansion of the information available to us at this time, and after completion of the Report to Congress, to develop a more comprehensive strategy for management of plastic wastes.

Concluding Remarks

In conclusion, I would like to reiterate that completion of the Report to Congress and other work currently under way prior

to regulating a particular aspect of the plastics problem would allow us to develop a comprehensive strategy for plastics similar to the one we are currently developing for all municipal waste. In the interim we can work to analyze the effects, both intended and unintended, of laws and policies similar to S. 1986 enacted at the State level. We stand to gain valuable knowledge by determining the most effective implementation strategies used by the States, and can look at their potential applicability to achieving our shared overall goal of reducing plastic pollution in the environment--a goal which, in part, is represented by S. 1986.

This concludes my prepared remarks. I would be happy to respond to any questions you have at this time.

STATEMENT OF ROBERT P. SMITH, DEPUTY ASSISTANT DIRECTOR FOR FISH AND WILDLIFE ENHANCEMENT, U.S. FISH AND WILDLIFE SERVICE, DEPARTMENT OF THE INTERIOR, BEFORE THE HOUSE COMMITTEE ON MERCHANT MARINE AND FISHERIES, SUBCOMMITTEE ON FISHERIES AND WILDLIFE CONSERVATION AND THE ENVIRONMENT, AND THE COMMITTEE ON ENERGY AND COMMERCE, SUBCOMMITTEE ON TRANSPORTATION, TOURISM AND HAZARDOUS MATERIALS, CONCERNING S. 1986, AN ACT TO STUDY, CONTROL AND REDUCE THE POLLUTION OF AQUATIC ENVIRONMENTS FROM PLASTIC MATERIALS

July 26, 1988

Mr. Chairman, I appreciate the opportunity to provide testimony on behalf of the Fish and Wildlife Service (Service) regarding S. 1986, a bill to study, control and reduce the pollution of aquatic environments from plastic materials, and for other purposes.

S. 1986 would require the Environmental Protection Agency to require, via regulation, that plastic 6-pack holders be made of naturally degradable material such that, upon disposal, they will be reduced to benign subunits under the action of normal environmental forces within the shortest period of time consistent with the intended use of the item and the physical integrity required for such use. This regulatory action would be required to be taken within two years after enactment of this law.

As you are aware, an Interagency Task Force was formed in 1987 by the Domestic Policy Council to study the issue of persistent marine debris. Its charge was to "assess the problem and the need for research, identify potential research measures, and consider alternative action to address

the problem of plastic marine pollution." This report contained five major recommendations to address the persistent debris issue:

1) Establishment of a leadership role for the Federal government which acknowledges that an effective program is only possible with strong involvement from state and local governments;

2) Development of comprehensive educational materials on problems caused by marine debris and ways to solve them;

3) Vigorous implementation of all laws related to marine debris (especially Title II of Public Law 100-220, the Plastics Pollution Research and Control Act of 1987);

4) Federally sponsored research to identify and quantify deleterious effects of marine debris on fish and wildlife, coastal communities, and vessels; land-based sources of marine debris; and potential uses for, by-products of, and effects of by-products of degradable plastic products; and

5) Federal promotion of beach clean-up and monitoring with participation from all levels.

The Service believes that any threats to the nation's wildlife resources which may be posed by 6-pack yokes have

already been addressed in the report by the Interagency Task Force on Persistent Marine Debris which has been accepted by the Domestic Policy Council. We cannot support S. 1986 at this time since we do not have information that indicates that 6-pack yokes are a major threat to fish and wildlife resources. In addition, no comprehensive studies have been conducted regarding the toxicity of products from degradable products.

In particular, the recent report specified that Federal agencies need to evaluate what happens to the plastic in the marine environment as manufacturers begin producing photo- and bio-degradable products. For instance, will it sink, break-up, or dissolve? If algae growns on it, will degradation slow? Is microbial action necessary for degradation? Will it emit toxic substances as it degrades? Are there potential impacts when degradable plastics are disposed of in landfills? Given these important considerations to be addressed, the report concluded that we need to determine answers to these and many other questions before we require that specific products be degradable solely on the basis of the problems that they cause as marine debris.

Your invitational letter to the Service indicated that the Subcommittee is especially interested in any information that we might have concerning the extent to which 6-pack rings pose a threat to the health of fish and wildlife. As

recognized by the Task Force, 6-pack rings constitute only one of the materials which is part of the plastic debris problem. There is very little scientific data that is specific to plastic yokes; therefore, my testimony will be based primarily on anecdotal information and our perceptions of the magnitude of the 6-pack ring "problem" that this bill addresses.

The Service has informally canvassed several of our coastal National Wildlife Refuges, as well as bird rehabilitation groups across the country. As a result of this telephone survey, the Service believes that impacts to wildlife are occasional. However, when wildlife do become entangled in one of these devices, the effects can be fatal.

Ten National Wildlife Refuges along all of the nation's coastline were contacted. Six refuges reported occasional sightings of birds and other species entangled in 6-pack rings. The most common species impacted were gulls; including herring gulls, greater black-backed gulls, laughing gulls, California gulls and western gulls. It is speculated that the opportunistic tendency of the larger gulls to feed around garbage dumps and vessels underway may make them more susceptible to entanglement in 6-pack holders. Other species reported entangled in these yokes, as part of the survey, include Canada geese, western grebes, black bass, channel catfish, and feral pigs. The average number of 6-pack ring

instances per refuge contact during this informal survey was one observation per year for all types of wildlife.

As noted in S. 1986, several states have enacted laws requiring that plastic ring carrier devices be made from degradable material. Anheuser Busch, one of the largest breweries in the United States, completed the conversion of 6-pack yokes for their products to degradable materials last year. In summary, however, the Service believes that the five major recommendations in the Task Force report should be implemented prior to any action on this bill.

This concludes my testimony, Mr. Chairman. I thank you for the opportunity to appear before you today and will gladly answer any questions you or any members of the Subcommittee may have.

TESTIMONY OF ILLINOIS TOOL WORKS INC.

BEFORE A JOINT MEETING OF THE HOUSE SUBCOMMITTEES ON

FISHERIES, WILDLIFE CONSERVATION AND THE ENVIRONMENT AND

TRANSPORTATION, TOURISM AND HAZARDOUS MATERIALS

RE. SENATE BILL 1986

JULY 26, 1988

My name is Michael Hudson, Vice President of Public Affairs, Illinois Tool Works Inc. (ITW), a diversified manufacturer based in Chicago, Illinois, with operations in 23 states and 17 foreign countries. One of our divisions, ITW Hi-Cone with manufacturing facilities in California, Illinois and North Carolina, makes the plastic connecting device known as the Hi-Cone carrier (aka plastic loop retainer) which is specifically addressed by Senate Bill 1986. Hi-Cone is the registered trademark of the plastic beverage carrier developed, patented and marketed by Illinois Tool Works.

The Hi-Cone carrier has been in use since the 1960's as a convenient and cost effective method of multi-packing various types of containers including beverage cans, household products, pet food, motor oil, and infant formula. Due to its unique design, light weight and speed of application, the Hi-Cone carrier has gained wide acceptance in a variety of markets. While the commercial success of the carrier is well established, it faces aggressive competition from other packaging systems (i.e., coated paperboard and shrink-wrap plastic film).

There is a packaging equation that says: "the less material, the less solid waste". Hi-Cone carriers required to package 1,000 six-packs would only weigh 8.7 pounds and occupy only .17 cubic feet of space; by contrast, shrink film used to package 1,000 six packs would weigh 21 pounds and occupy .42 cubic feet of space and paperboard used to package a like number of containers would weigh 96.9 pounds and occupy ten times more space or 1.71 cubic feet. Thus, the Hi-Cone carrier is already making a major, positive contribution to reducing packaging related solid waste in the United States.

In the early 1970's, ITW began to explore the possibility of making our carrier out of degradable plastic. Our technical people investigated many systems including, metallic compound additives, starch additives, and other additives based on polymers such as propylene and butylene. Unfortunately these systems were either ineffective, changed physical properties too drastically, imparted odors and colors which were unacceptable, or the actual rate of degradation could not be predicted or controlled.

We also evaluated an ethylene/carbonyl copolymer, which like the other systems evaluated, was photodegradable or sensitive to ultraviolet light. However, the photo-sensitive group in the material was incorporated into the backbone of the polymer rather than mixed in as an additive. This material was clean, degraded on a predictable basis, and could be formulated to achieve the necessary physical properties critical to our product's performance. This copolymer is the modified low density polyethylene material we call ECO and is used to make all of our photodegradable carriers. It was our purpose then, and remains our purpose today, to address two problems that could result from the improper disposal of our product -- litter and entrapment.

Photodegradation begins as soon as the carrier is exposed to the ultraviolet rays and, as the u/v exposure continues, the carrier will become more and more embrittled. Should the carrier become covered (i.e., snow, leaves, etc.) or stored (i.e., warehouse, behind plate glass, etc), degradation ceases. If this were not the case, product integrity and consumer safety would be compromised. After a period of time, depending on the season, the amount of u/v exposure and natural forces in the environment such as wind, water, etc., the carrier will cease to be recognizable as either a package or as litter. The actual time required varies between several weeks in the summer to a few months in the winter.

The relatively short period of time required for the degradabilty of the Hi-Cone carrier has been documented numerous times by both independent and government sponsored scientific studies. These include Claremont Colleges in California, the University of Connecticut, the University of Maine and Oregon State University.

Of particular concern to the sponsor of this legislation and this panel is the product's performance in the marine environment. Because low density polyethylene has a specific gravity lower than water (fresh or salt), the carrier will float. Since it is on top of the water, it will be exposed to sunlight and thereby to ultraviolet energy.

Once again, as long as there is any exposure to u/v the carrier will degrade. These findings, as to the product's performance in the marine environment, have been confirmed in the May Interagency Task Force on Persistent Marine Debris report and in other publications. The preliminary results of a study commissioned by the Marine Mammal Commission indicates that the ECO Carrier degrades in the marine environment within a time frame only marginally longer than the time required to degrade on land.

Since the introduction of the ECO Carrier, seventeen states have enacted legislation requiring the use of degradable connecting devices. Appendix A lists these states chronologically and cites the type of connecting device each state requires to be degradable.

For the Committee's review and use, I have also enclosed a map (see appendix B) of the United States identifying those states:

* where such laws are currently in effect (11);
* where recently enacted laws will become effective within the next eighteen months (6); and
* where degradable connecting device legislation is likely to be enacted in 1989 (8).

The content of S. 1986 today, was originally Amendment #1776 to Title II, Section 2202 of the Senate version of legislation to ratify and implement Annex V of the Marpol Treaty. This language was not a part of the House version of the legislation, H.R. 3674, which was the bill passed by the Congress and enacted into law as PL 100-220.

S. 1986 requires the Environmental Protection Agency to adopt regulations requiring only the plastic ring carrier to be made from degradable resins.

We have two concerns about the effect this legislation could have on our product and operations.

First, as mentioned earlier, Hi-Cone has two packaging competitors: coated paperboard and shrink-wrap plastic film. Though all three products have been found discarded improperly both on land and in the marine environment, S. 1986 deals only with the Hi-Cone carrier. An earlier version S.534, contained language that covered all plastic carriers. S. 1986 differs from the intent of the actions already taken by several states which cover all three products (see appendix A). We feel S. 1986 would be strengthened by making it more consistent with existing and prospective state laws.

Second, S. 1986 as it is currently written could be interpreted to prevent us from making <u>any</u> nondegradable carriers in our U.S. facilities. Currently, all the carriers exported to our international customers for products distributed in Canada, Latin America and the Far East are manufactured in our U.S. facilities. Because the laws and customs of the countries in which they do business do not require degradable connecting devices, we export only nondegradable carriers.

If we were unable to supply these customers with non-degradable carriers, they might turn to other types of packaging (i.e., paperboard or shrink film). This could mean a major loss of exports to Hi-Cone, without making any contribution to goals of the legislation.

In conclusion, I want to thank you for the opportunity this afternoon to present this panel with a better understanding of our product and the commercial environment in which we exist and to present you with our concerns. I would be happy to answer any questions you may have.

APPENDIX A

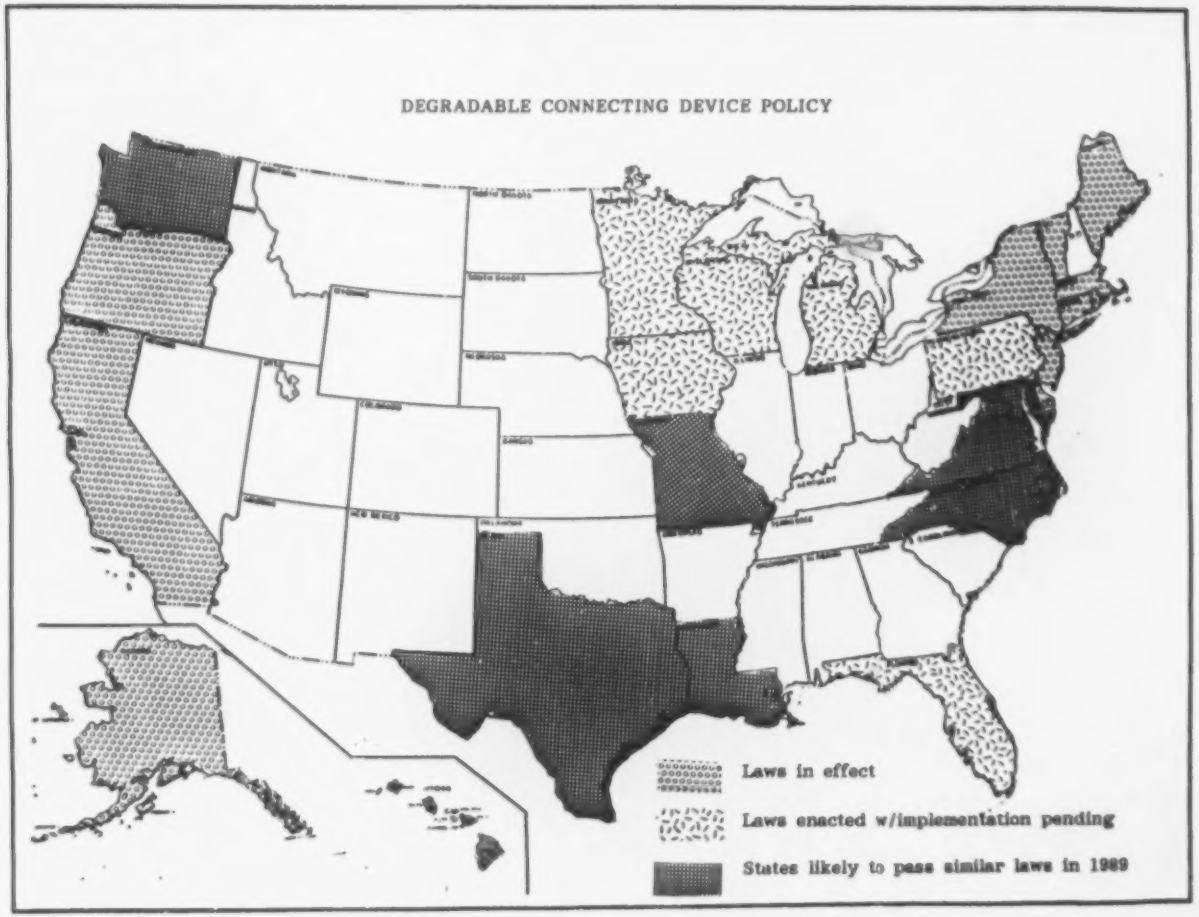
State Laws Requiring Degradable Connecting Devices

Effective Date	State	Type of Device*
1/1/77	Vermont	"plastic rings or similar devices"
1/1/78	Maine	"plastic rings or other plastic holding device"
9/1/78	Oregon	"plastic rings or other material"
10/1/81	Alaska	"plastic rings or similar plastic devices"
11/1/82	California	"plastic rings or similar plastic devices with holes more than 1 and 1/2 inches"
1/15/83	Delaware	"plastic rings or similar devices"
1/17/83	Massachusetts	"plastic rings or any other device or material"
9/12/83	New York	"device constructed of plastic"
10/1/84	Connecticut	"device constructed of plastic rings or material"
4/21/86	New Jersey	"device made of plastic"
7/1/87	Rhode Island	"any device constructed of plastic"
10/1/88	Pennsylvania	"plastic rings or similar plastic connectors"
1/1/89	Minnesota	"polyethylene beverage rings or plastic material"
6/1/89	Michigan	"device constructed of plastic rings"

7/1/89	Florida	"device constructed of plastic rings or any other device"
7/1/89	Iowa	"device constructed of a material which is not biodegradable or photodegradable"
1/1/90	Wisconsin	"device constructed of a material which does not decompose by photodegradation or biodegradation"

*Excerpted from state laws

APPENDIX B


DEGRADABLE CONNECTING DEVICE POLICY
Laws in effect
Laws enacted w/implementation pending
States likely to pass similar laws in 1989

Degradable Hi-Cone Carriers

ENVIRONMENTAL AND ECONOMIC UPDATE

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Degradable Carrier Laws (Chart) ..... Insert

ENVIRONMENTAL AND ECONOMIC UPDATE

The Hi-Cone® carrier (plastic loop retainer) has revolutionized the beverage industry since its first market tests in 1962, all but eliminating paperboard in multi-packaging cans. It is preferred by consumers for its ease in handling, storage, and disposal, and package integrity after moisture or abuse. At the same time, brewers and soft drink producers enjoy high efficiency and material cost savings of at least 50% over paperboard alternatives.

The Hi-Cone carrier is also environmentally preferable to paperboard. It takes 75% less energy and 97% less water to manufacture. More important to many communities, it creates 90% less solid waste. Today, there is also the additional solid waste advantage offered by the photodegradable Hi-Cone carrier for multi-packs.

The photodegradable carrier was developed in the early 1970's. Two approaches to degradability were studied. One involves material which can be attacked by bacteria and fungi and converted by them from a complex molecular structure to simpler gasses and organic compounds (biodegradability). This is the classic landfill or sewage disposal method. The second involves a material which is sensitive to sunlight, and this is called photodegradability. In this case, the ultra-violet energy from the sun breaks down the plastic material's complex long-chain molecules into shorter chains. This is a more desirable method for a product that is not in a landfill, because the same ultra-violet energy inhibits bacteria and fungi from being present in any significant quantity above ground.

The Hi-Cone ECO® carrier uses the photodegradable method. The degradation process starts on the surface of the earth and as the material's chains are broken, the action of wind and rain causes the carrier to crumble into polyethylene dust. This method does not result in any toxic or harmful by-products and does not inhibit normal degradation in a landfill. Photographs of this process follow on pages 4 and 5.

The amount of time required for degradation varies from one area of the country to another and from season to season, from several weeks to several months, depending on the amount and intensity of exposure. More specific research data on the degradable carrier follows on pages 6-9.

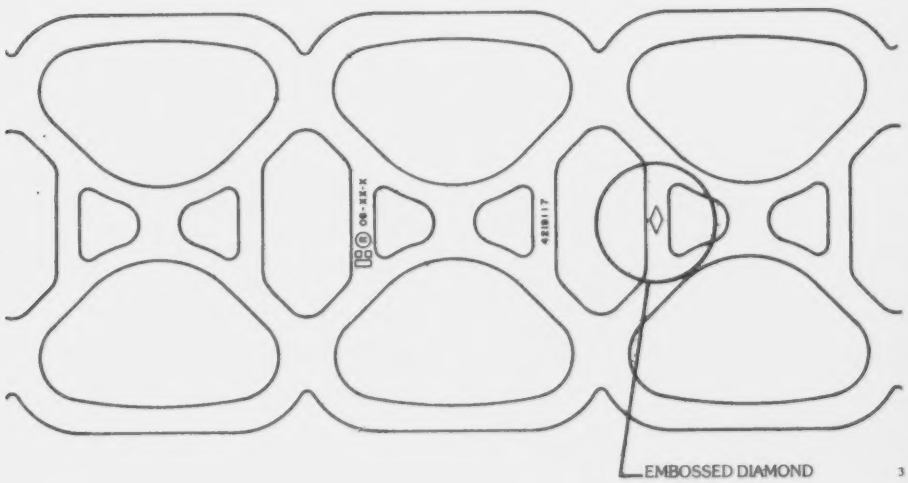
Since 1975, several states have passed legislation requiring carriers sold in those states to be degradable. A chart of those states and the beverages covered is inserted in the back of this brochure.

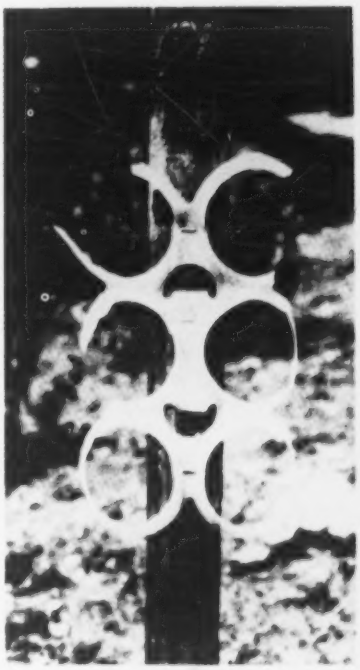
Typically, the requirement is stated in language such as:

> No beverage shall be sold or offered for sale in this State in metal containers connected to each other by a separate holding device constructed of plastic rings or other device of material which is not degradable. Degradable means decomposition by photodegradation, chemical degradation, or biodegradation within a reasonable period of time upon exposure to the elements.

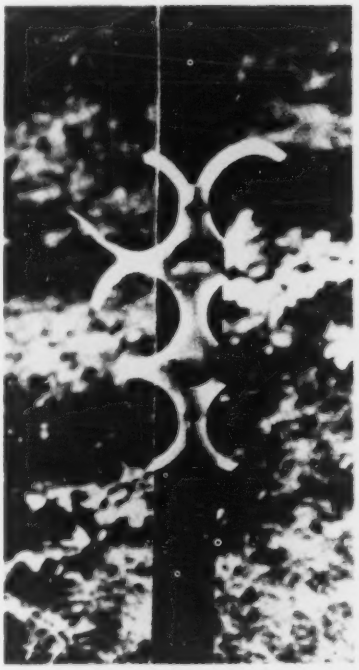
In each of the states where official certification is required, the degradable Hi-Cone carrier has been certified for use. Copies of these certification letters follow, beginning on page 10.

Each degradable carrier is clearly marked with a diamond embossed on the carrier in the area adjacent to the finger hole as shown below. This allows canners, retailers, and consumers to determine that the carrier is degradable and meets the specifications of state law.





30 DAYS

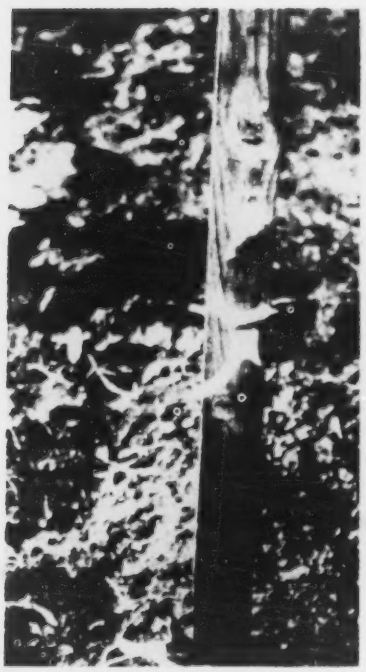


60 DAYS

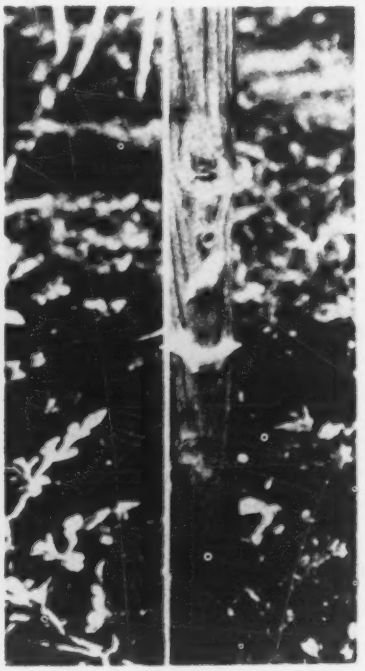
DATA FOR ENVIRONMENTAL

	PAPERBOARD (per 1,000 six packs)
Solid Waste (by weight)	96.9 lbs
Solid Waste (by volume)	1.71 cubic feet
Energy*	2 MM btu
Water**	881 gallons

*US Environmental Protection Agency Study (1974)
**US Environmental Protection Agency Study (1974) and Du Bois Richardson Study (1974)



90 DAYS



115 DAYS

COMPARISONS OF PACKAGING

HI-CONE
(per 1,000 six packs)

8.4 lbs

0.17 cubic feet

0.489 MM btu

22.9 gallons

MEMBERS OF THE CLAREMONT COLLEGES

24 January 1983

Title:
"Solar Degradation of Modified Polyethylene"

Report Presented to:
Mr. Harry Pillman
ITW
HI-CONE Division
Itasca, Ill.

Prepared by:
Dr. Anthony Fucaloro
Associate Professor of Chemistry
Joint Science Department
Claremont Colleges
Claremont, CA 91711

SOLAR DEGRADATION OF MODIFIED POLYETHYLENE

The object of the study was to monitor the extent of degradation in sunlight of polyethylene chemically modified so as to embrittle on exposure to the ultraviolet radiation from the sun. The modified polyethylene is of the type used by ITW to fabricate container holders such as their HI-CONE carriers. The methods of exposure and testing conform to the accepted practices used by other workers so that meaningful comparisons of results can be made. The study was done in Claremont, California[1] with exposure-dates running from February, 1982 to June, 1982.

Samples of pure polyethylene and modified polyethylene[2] were mounted on a wooden rack backed by a metal mesh. The rack was tilted at an angle of 45° from the vertical and oriented toward the south. This is a standard configuration for studies of this type. Exposure-times were calculated from sunrise-sunset tables and represent dawn to dusk exposures including the full range of weather conditions[3]. Therefore, the results listed later in this report cover all types of exposures likely to be encountered by samples discarded in the environment during the late winter through early summer.

There are several ways to measure the degree of embrittlement of a plastic. The conventional procedure employed in this study includes the stretching of the sample at a constant rate and the measurement of the extent of elongation of the sample at the time of rupture. The data obtained from each measurement includes the time of exposure to dawn to dusk-sunlight and the extent of elongation to rupture upon stretching the sample. This latter quantity is reported as percent elongation to rupture. Thus, a sample which ruptures after it has been stretched to three times its original length, is reported to have a 300% elongation to rupture.

Typically, samples of pure polyethylene and modified polyethylene experiencing no exposure to sunlight show approximately 500% elongation to rupture. The pure and modified polyethylene are indistinguishable at this point and appear to have the identical tensile strengths. For exposure times up to about six hours, little if any embrittlement is seen to occur as evidenced by no significant reduction in the percent elongation to rupture-values. Again, the pure and modified polyethylene are indistinguishable. Beyond six hours of exposure, the values of the percent elongation to rupture for the samples of the modified polyethylene fall off in a roughly exponential fashion[4]. Approximate values of this parameter are 200%, 150%, 100%, and 50% for exposures to sunlight of 25 hours, 35 hours, 50 hours, and 75 hours, respectively. For exposure times much beyond 250 hours of dawn to dusk sunlight, the samples become so fragile as to be difficult to handle. Thus, assuming approximately 12 hours of sunlight per day, only four days of exposure are necessary for samples to have their percent elongation to rupture-values reduced by a factor of five, i.e., from 500 to 100%. On the other hand, pure polyethylene shows little or no effect on exposure to sunlight up to at least 100 hours of exposure.

(1) Latitude: 34° 05' 34"N
(2) 6 inches x ½ inch x 0.02 inch
(3) Hourly information of cloud cover and general weather conditions are available from the National Oceanic and Atmospheric Administration (NOAA).
(4) A useful empirical expression developed here to approximately describe the degree of embrittlement of modified polyethylene in the range of six to 100 hours of exposure is

$$E = E_0/(10^{0.01t}),$$

where E_0 and E are, respectively, the percent elongation to rupture-values of the sample unexposed to sunlight and exposed for a time, t, given in hours. Thus, assuming E_0 = 500%, and for exposures of 25, 35, 50, and 75 hours, E is calculated to be 211, 149, 89, and 38%, respectively.

ENERGY CENTER
THE UNIVERSITY OF CONNECTICUT
BOX U - 139
STORRS, CONNECTICUT 06268

W. W. Bowley, Director - Energy Center
D. P. Jackson, Director - Solar Energy Division

INTRODUCTION

In this report, results of an investigation into the effects of ordinary sunlight upon the physical properties of various Hi-Cone carrier materials are presented. The purpose of the study was to determine the extent to which outdoor exposure to the sun's rays converts the polyethylene plastic used in the carriers from a tough stretchable material to an easily broken, brittle material. This behavior, called photodegradability, was investigated for ordinary carrier polyethylene and three other types of polyethylene especially formulated to enhance the photodegradability. The results of the study showed that the photodegradable type of polyethylene became extremely brittle over one month of outdoor exposure to sunlight, whereas ordinary polyethylene carrier material was essentially unaffected.

PROCEDURE

Forty-five strips each of four different kinds of Hi-Cone carrier polyethylene were tested. The strips were fastened to a tilted, south-facing outdoor exposure rack at the University of Connecticut Energy Center. Three of the sets were various formulations of photodegradable polyethylene while the fourth set was ordinary polyethylene. The amount of solar energy striking the samples was continuously recorded using an Eppley Laboratories Precision Pyranometer. This instrument is used throughout the world by weather bureaus to record the strength of sunlight.

Three samples of each type of material were removed periodically over a one-month period. The amount of time and solar energy exposure of each set of samples was recorded. When all of the samples had been removed they were sent to a commercial testing laboratory, A.K.O., Inc. of Enfield, Connecticut. There the brittleness of the specimens was evaluated using a tensile testing machine. A nationally accepted standard procedure was followed in the testing of the samples—American Society of Testing and Materials (ASTM) procedure D882.

Brittleness can be characterized by the extent to which a sample of material can be stretched beyond its original length without breaking it. Brittle materials are capable of very little elongation before breaking whereas tough or "plastic" materials may be stretched to several times their original length before breaking.

All four types of carrier material were found to be capable of around 600% total elongation if they had not been exposed to the sun. The exposed samples exhibited drastic reduction in elongation resulting from solar exposure whereas the ordinary polyethylene was essentially unaffected. Samples of the photodegradable material after 30 days of exposure could not be bent sharply without breaking them. These results are summarized in the following table.

Time (days)	% Total Radiation Exposure	% Polyethylene Elongation			
		Photodegradable Types			Ordinary Types
		FB	FA	ZA	IA
1	3	622	420	722	673
8	29	80	70	47	535
30	100	20	8	6	630

CONCLUSIONS

Hi-Cone photodegradable polyethylene becomes brittle with exposure to ordinary sunlight with most of the reduction in elongation occurring within a week of exposure. Ordinary polyethylene carrier material similarly exposed is relatively unchanged.

STATE OF CALIFORNIA—THE RESOURCES AGENCY

STATE SOLID WASTE MANAGEMENT BOARD

1020 NINTH STREET, SUITE 300
SACRAMENTO, CALIFORNIA 95814

AUG 0 2 1982

Michael H. Hudson
Vice President, Public Affairs
Illinois Tool Works Inc.
8501 West Higgins Road
Chicago, Illinois 60631

Dear Mr. Hudson:

This letter serves to remind you as a manufacturer of plastic beverage container connectors of a requirement under California state law which could affect you in the near future.

As you recall, effective November 1, 1982, Section 24304.5 of the California Health and Safety Code requires that no beverage shall be sold or offered for sale at retail in California in beverage containers connected to each other with plastic rings or similar plastic devices which are not classified by the State Solid Waste Management Board as degradable.

Certain plastic devices are exempt from this requirement: 1) those which do not contain an enclosed hole or circle of more than 1-1/2 inches in diameter or which do not contain a hole; and 2) those in which the ring is broken at the time the beverage connector is removed from the ring.

Any person who sells at wholesale or distributes to a retailer for sale at retail in California a beverage in containers which are connected to each other in violation of this law shall be punished by a fine not to exceed one thousand dollars. (A copy of the chaptered bill is enclosed to inform you of the specific requirements.)

This law was enacted because of the litter problem associated with nondegradable plastic connectors and because of the entrapment threat they constitute to fish, waterfowl and other small animals.

The State Solid Waste Management Board has notified major beverage companies currently doing business in California and legislative advocates representing other affected industries that the degradable Hi-Cone carrier has been certified by the Board as meeting the requirements under the law and is now commercially available.

The support of your company in publicizing the requirements and the effective date of this law is of great value toward ensuring compliance. Thank you for your assistance, and if you have any questions on this matter, please contact Mary Lou Shurtleff of my staff (916) 322-2650.

Sincerely,

John W. Hagerty

John W. Hagerty
Executive Officer

STATE SOLID WASTE MANAGEMENT BOARD

STATE SOLID WASTE MANAGEMENT BOARD

RESOLUTION 81-112

DETERMINATION OF THE COMMERCIAL AVAILABILITY
OF DEGRADABLE PLASTIC BEVERAGE CONTAINER CONNECTORS

WHEREAS, the Legislature enacted Assembly Bill 406, Statutes Chapter 1125, 1979, requiring the Board to determine the commercial availability of degradable plastic beverage container connectors; and

WHEREAS, after extensive testing of various types of photodegradable plastics by the plastics industry, a product has been developed and submitted in compliance with Assembly Bill 406; and

WHEREAS, the Board staff has evaluated the degradable plastic beverage container connector submitted and found it in substantial compliance with the requirement of the law; and

WHEREAS, such evaluation is made in the context of compliance with the law and is not to be construed as a product endorsement;

NOW, THEREFORE, BE IT RESOLVED, the State Solid Waste Management Board determines that a degradable plastic beverage container connector is commercially available in compliance with the provisions of Section 24184.5 of the Health and Safety Code and that one year after this date, no beverage shall be sold or offered for sale at retail in this state in beverage containers connected to each other with plastic rings or similar devices which are not classified by the State Solid Waste Management Board as degradable, as specified in law.

CERTIFICATION

The undersigned Executive Officer of the State Solid Waste Management Board does hereby certify that the foregoing is a full, true, and correct copy of a Resolution duly and regularly adopted at a meeting of the State Solid Waste Management Board held on October 29-30, 1981.

Dated: OCT 29 1981

John W. Hagarty
Executive Officer

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STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
& ENVIRONMENTAL CONTROL
EDWARD TATNALL BUILDING
P.O. BOX 1401
DOVER, DELAWARE 19901

OFFICE OF THE SECRETARY

TELEPHONE (302) 736-4403

March 31, 1982

Mr. Charles D. Broll, President
Pepsi-Cola Bottling Company
3501 Governor Printz Boulevard
Post Office Box 9342
Wilmington, Delaware 19809

Dear Mr. Broll:

This is in response to your February 25, 1982, inquiry regarding the suitability of Hi-Cone carriers for connecting containers to each other so as to be in compliance when the Delaware Beverage Container Regulations take effect.

We find the February 11, 1982, letter from Mr. P. H. Seager to yourself, to be sufficient attestation for hereby approving the Hi-Cone carrier on the basis of its photodegradable properties. You will not require any further Department approval for use of the Hi-Cone carrier when the regulations take effect.

We are pleased to note that you have already made arrangements to have stay-on tabs for metal containers since this will facilitate compliance with the regulations during the phasing-in period at a later date.

Your request for an aluminum can exemption cannot be granted since it is a specific stipulation of the legislation. However, we appreciate your comments and will enter them as part of the March 25 public hearing record.

Please feel free to call our office at 736-4701 if you should have any questions.

Sincerely,

John E. Wilson III
Secretary

cc: Thomas P. Eichler

JEW:jbb

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Maine Department of Agriculture

Stewart N. Smith, Commissioner

DIVISION OF INSPECTIONS
Clayton F. Davis, Director
State Office Building, Augusta, Maine 04333
Telephone 207/289-3841

June 13, 1980

Mr. Michael H. Hudson, Vice President
Public Affairs
Illinois Tool Works Inc.
8501 West Higgins Road
Chicago, Illinois 60631

Dear Mr. Hudson:

It is my understanding that your company holds the patent for the photodegradable plastic connector which is used on beverage containers and has the trade name of Hi Cone. This connector was given temporary approval by the Department of Agriculture in 1977.

The Maine Legislature gave the Hi Cone Connector its approval by enacting Legislative Document 2013 which was signed by the Governor on April 1, 1980.

Professor Richard Hill of the University of Maine conducted research which concluded that the Hi Cone Connector was photodegradable and so the Maine Legislature amended the so-called Bottle Law to approve the use of these connectors. A copy of the law is enclosed.

Yours truly,

Clayton F. Davis, Director
Division of Inspections

CFD:jh
Enclosure

Divisions
Administration -- Animal Industry -- Inspections -- Markets -- Plant Industry -- Promotions -- Quality Control
Commissions, Committees and Boards
Harness Racing Commission; Lobs Commission; Soil & Water Conservation; Weights and Measures; Potato Marketing Board; Potato Research Committee; Potato Inspection Committee; Potato Grading Committee; Potato Standardization Committee; Potato Advisory Committee; Potato Marketing Improvement Fund; Potato Marketing Improvement Fund Committee; Potato Marketing Improvement Fund Advisory Committee; Potato Marketing Improvement Fund Grading Committee; Potato Marketing Improvement Fund Inspection Committee; Potato Marketing Improvement Fund Standardization

Oregon Liquor Control Commission

9079 S.E. McLOUGHLIN BLVD., PORTLAND, OREGON
(MAILING ADDRESS: P.O. BOX 22297, Portland, Oregon 97222)

November 9, 1977

Mr. Steve A. Stefan
Vice President and General Manager
Hi-Cone
A Division of Illinois Tool Works, Inc.
1140 West Bryn Mawr Avenue
Itasca, Illinois 60143

Dear Mr. Stefan:

The Hi-Cone carrier, for metal beverage containers, manufactured by your company appear to be in compliance with the Oregon law that is effective September 1, 1978. However, the use of these carriers would be at the risk of the person who sells or offers for sale metal beverage containers with the carrier at retail in the state of Oregon.

ORS 459.850 (5) states "No person shall sell or offer for sale at retail in this state metal beverage containers connected to each other by a separate holding device constructed of plastic rings or other material which will not decompose by photobiodegradation, chemical degradation, or biodegradation within 120 days of disposal."

If in the future the Hi-Cone carriers by use indicates that they are not in compliance with the law, the carrier would not be permitted to be used in Oregon.

Yours very truly,

W. T. Moore, Jr.
Director
Special Investigations Division

WTM/14j

An EQUAL OPPORTUNITY EMPLOYER

14

State of Vermont

AGENCY OF ENVIRONMENTAL CONSERVATION
MARTIN L. JOHNSON, Secretary
Montpelier, Vermont 05602
DIVISION OF ENVIRONMENTAL PROTECTION

Department of Fish and Game
Department of Forests and Parks
Department of Water Resources
Environmental Board
Division of Environmental Protection
Division of Recreation
Division of Planning
Natural Resources Conservation Council

April 16, 1976

Mr. Robert G. Rettig, President
Packaging Systems Group
Illinois Tool Works, Inc.
8501 West Higgins Road
Chicago, Illinois 60631

Dear Mr. Rettig:

Enclosed is a copy of an Informal Advice Record which I have now received in written form from the office of the Attorney General.

On the basis of this advice, and the materials submitted in support of your request, I am therefore approving your photo/biodegradeable Hi-Cone Carrier for use in Vermont, as conforming to the intent of the Statute.

This means, in short, that the aforementioned item may continue in use after January 1, 1977.

Sincerely yours,

Donald W. Webster
Director

DWW:fmt

STATE OF ALASKA

BILL SHEFFIELD, GOVERNOR

DEPT. OF ENVIRONMENTAL CONSERVATION

Telephone (907) 465-2653
Address Pouch O
Juneau, [illegible] 9981

July 9, 1985

Illinois Tool Works, Inc.
8501 - West Higgins Road
Chicago, Illinois 60631-2887

Attn: Carol Holden

Dear Ms. Holden:

Thank you for your information on the plastic "Hi-Cone" beverage containers.

Our new requirements, along with the added definition of degradable are highlighted on section 46.06.090(b) and section 46.06.150(9) of the enclosed Chap. 6 AS 46.06.

By being degradable within the required time, and by also having the destinguishing mark your plastic ring carriers meet our standards.

Again, let me thank you for your efforts to comply with our requirements.

Yours Truly,

Stan Osborn

SO/pc

Enclosures

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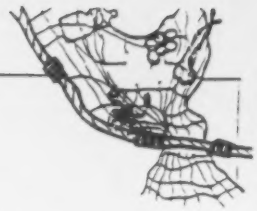

The Entanglement Network

Sponsored by:
American Cetacean Society
American Humane Association
Animal Protection Institute of America
California Marine Mammal Center
Center for Coastal Studies
Center for Environmental Education
Cetacean Society International
Defenders of Wildlife
Environmental Defense Fund
Friends of Animals
Friends of the Sea Otter
The Fund for Animals
Greenpeace
HEART
The Humane Society of the United States
International Wildlife Coalition
Maine Audubon Society
National Consortium
National Audubon Society
Natural Resources Defense Council
The Oceanic Society
Society for Animal Protection Legislation
Whale Center
World Wildlife Fund

A cooperative effort to facilitate the exchange of information on the problems of marine debris, entanglement, and incidental take.

TESTIMONY OF

DEFENDERS OF WILDLIFE
AND
AMERICAN CETACEAN SOCIETY
AMERICAN HUMANE SOCIETY
AMERICAN SOCIETY FOR THE PREVENTION OF
CRUELTY TO ANIMALS
ANIMAL PROTECTION INSTITUTE OF AMERICA
CENTER FOR COASTAL STUDIES
CENTER FOR ENVIRONMENTAL EDUCATION
CETACEAN SOCIETY INTERNATIONAL
COMMITTEE FOR HUMANE LEGISLATION
EARTH ISLAND INSTITUTE
ENVIRONMENTAL DEFENSE FUND
FRIENDS OF THE SEA OTTER
THE FUND FOR ANIMALS
HEART
THE HUMANE SOCIETY OF THE UNITED STATES
INTERNATIONAL FUND FOR ANIMAL WELFARE
INTERNATIONAL WILDLIFE COALITION
LIVING OCEAN SOCIETY
THE LONGTERM RESEARCH INSTITUTE
MAINE AUDUBON SOCIETY
MASSACHUSETTS SOCIETY FOR THE PREVENTION OF
CRUELTY TO ANIMALS
NORTHWIND UNDERSEA INSTITUTE
THE OCEANIC SOCIETY
SIERRA CLUB WILDLIFE COMMITTEE
SOCIETY FOR ANIMAL PROTECTIVE LEGISLATION
SUNCOAST SEABIRD SANCTUARY
THE WHALE CENTER
THE WASHINGTON HUMANE SOCIETY
THE WORLD WILDLIFE FUND

On Behalf of the Entanglement Network Coalition

Regarding Senate Bill 1986

Requiring That Plastic Six-pack Beverage Yokes Be Made of Naturally Degradable Materials

Before the House Subcommittee on Fisheries, Wildlife and the Environment, Committee on Merchant Marine and Fisheries, and the House Subcommittee on Transportation, Tourism and Hazardous Materials, Committee on Energy and Commerce.

July 26, 1988

Testimony presented by:
Albert M. Manville II, Ph.D.
Senior Staff Wildlife Biologist, Defenders of Wildlife,
and Chair, The Entanglement Network Coalition

INTRODUCTION

Honorable Chairmen and members of the Subcommittees, thank you for the opportunity to testify here today. I am Dr. Albert M. Manville, senior staff wildlife biologist for Defenders of Wildlife and chair of the Entanglement Network Coalition (Network). This testimony is being presented today on behalf of the American Humane Society, American Society for the Prevention of Cruelty to Animals, Center for Coastal Studies, Center for Environmental Education, Cetacean Society International, Committee for Humane Legislation, Defenders of Wildlife, Earth Island Institute, Environmental Defense Fund, Friends of the Sea Otter, The Fund for Animals, HEART, The Humane Society of the United States, International Fund for Animal Welfare, International Wildlife Coalition, Living Ocean Society, The Longterm Research Institute, Maine Audubon Society, Massachusetts Society for the Prevention of Cruelty to Animals, Northwind Undersea Institute, The Oceanic Society, Sierra Club Wildlife Committee, Society for Animal Protective Legislation, Suncoast Seabird Sanctuary, The Whale Center, The Washington Humane Society, and World Wildlife Fund, all of which are members or participants in the Entanglement Network. The Network is a consortium of some 38 wildlife, animal welfare, and conservation organizations which serves as the unified voice of the environmental community on entanglement, incidental take, and debris ingestion.[1]

As you know, the 100th Congress made significant, first-ever strides in dealing with the dilemma of burgeoning plastic debris in the marine environment through passage of the Plastic Pollution Control Act of 1987 (H.R. 3674; later P.L. 100- 220, Title II). This law authorizes a number of measures intended to reduce and ultimately eliminate plastic pollution, particularly in the marine environment. A major gap in this law, however, is the lack of a requirement for degradability in certain types of plastic. Passage of Senate Bill 1986 will help accomplish that goal by requiring degradability of six-pack beverage container yokes (for bottles and cans) found to be injurious or fatal to living marine resources such as marine mammals, seabirds, other migratory waterfowl, sea turtles, and fish.

---

[1] Entanglement refers to the capture, entrapment, and often death of animals in lost or discarded plastic debris, including fishing nets (so-called "ghost nets"), net fragments, packing bands, six-pack yokes, and other items. Those nontarget species captured in active fishing nets, seines, trawls, or related equipment are termed incidental take.

The United States, with approximately 6 percent of the world's population, uses some 36 percent of the world's resources. Our production and use of plastic continues at a near-exponential rate, with 53 billion pounds of plastic sold in the United States in 1987 alone and climbing. As a result of this massive use, we presently dispose of some 700,000 tons of plastic into our oceans each year. To deal with this plastics problem will require, in addition to the legislation passed last year, a multifaceted approach including recycling, waste reduction, return to biodegradable nonplastic alternatives, enforcement on dumping, and the use of degradable plastic -- the latter option being the subject of this hearing.

Through passage of this six-pack legislation before you today, a message will be sent to the plastics industry, product users, and the general public that Congress considers degradability a viable option in dealing with the plastic refuse problem and that Congress is especially concerned about the impacts of plastics on fish and wildlife resources. In addition, this legislation will encourage the plastics industry to more actively pursue the development and manufacture of degradable plastics. We do not intend to imply that passage of this amendment will solve the overall problem of entanglement on all living marine resources. Six-pack beverage yokes are, however, particularly egregious in their impacts on wildlife, as birds, mammals, fish, and other wildlife accidentally or purposefully stick their heads through them, get their feet enmeshed in them, or ingest them (1,2). Unable to dislodge the plastic holders, animals often grow into them, resulting in slow strangulation, suffocation, gradual starvation, injury, infection, and ultimately death. Their entrapment also makes them unnecessarily vulnerable to predators.

DISCUSSION

I have been asked to discuss the known and documented impacts of six-pack beverage yokes on fish and other wildlife. Although scientifically documented evidence of entanglement is often anecdotal -- most deaths going unobserved by man -- there are rough estimates of annual mortality worldwide, including at least 100,000 marine mammals and 1 million seabirds that are believed to die in plastic debris, including six-pack yokes as well as nets and net fragments (3,4). Death is by drowning, from exhaustion, by starvation, by strangulation, from infection, or by predators.

Incidents of six-pack yoke entanglement have been reported from Maine (5; around the growing necks of seals), Massachusetts (6; sea gulls), California (2; juvenile California sea lions), and Alaska (7; Northern fur seals), to name but a few examples in both the Atlantic and Pacific oceans. Carelessly discarded plastics, including six-pack yokes, have even been reported as a

danger to pets (8). Regarding plastic entanglement, the majority of what is seen and reported involves animals on shore. These reports probably represent only a fraction of what is entangling fish and wildlife on the open oceans. And since most six-pack beverage yokes are presently made of nondegradable materials, their lifetimes can last for centuries, making it virtually inevitable that some marine animal will eventually swallow them or become ensnared in them. One problem with documenting incidents of entanglement is the lack of a centralized data bank or information collection source. The National Marine Fisheries Service's Marine Entanglement Research and Education Program in Seattle, Washington, has good source information on this subject, but not a data base on six-pack yoke entanglement.

I have just made a 10-day survey of the Aleutian Islands from Attu (the most westerly part of North America) to Adak. The purpose of this trip was to record and photo-document the incidence, extent, and kinds of plastic debris found at sea and on the shore in these remote Pacific islands, as well as evidence of any entangled fish or other wildlife. Six-pack yoke presence was also assessed.

While some would argue that more hard scientific evidence on six-pack yoke entanglement is necessary, the logical question really is, "when is enough evidence sufficient?" The groups signing on to this testimony strongly feel that sufficient data are available and that it is now time to take steps to start solving the problem. This brings us to the legislation before you today.

State Legislation

As of this date, 16 states have enacted legislation requiring the use of degradable plastics in beverage containers: Alaska, California, Connecticut, Delaware, Florida, Iowa, Maine, Massachusetts, Michigan, Minnesota, New Jersey, New York, Oregon, Rhode Island, Vermont, and Wisconsin. Legislation banning nondegradable six-pack rings is awaiting signature in the Pennsylvania House and Senate. Other states have introduced similar legislation and more probably will as public awareness of the problems of nondegradable plastic rings spreads across the country.

Some of the states have enacted relatively simple legislation without delving into the more technical aspects of plastics degradation. Other states, such as Alaska, California, Florida, Iowa, Michigan, and Rhode Island, have tried to define degradability more exactly or have addressed the plastic rings issue more precisely. The following is an overview of the various state laws:

1. ALASKA

- Title 46,Chapter 6, Section 90(b) - Bans nondegradable plastic connectors on beverage containers; requires distinguishing mark on degradable plastics; Department of Environmental Conservation may require data as proof of degradability.
- Section 150(9) - " 'Degradable' means a characteristic of a material that allows the material to be broken down by biological, chemical, photochemical, or other physical processes (A) within two years upon exposure to natural elements; and (B) to a particle size and chemical composition that may be assimilated harmlessly and aesthetically into the environment without producing a residue or by-product determined by the department to be hazardous."
- Effective January 1, 1985.

2. CALIFORNIA

- Health and Safety Code Sec. 24384.5 - Bans nondegradable plastic beverage container connectors unless they (1) don't contain a hole more than 1 1/2 inches in diameter, or (2) ring is broken when beverage container is removed.
-"(b) For the purposes of this section 'degradable' means all of the following: (1) Degradation by biologic processes, photodegradation, chemodegradation, or degradation by other natural degrading processes. (2) Degradation at a rate which is equal to or greater than, the degradation by a process specified in paragraph (1) of other commercially available plastic devices. (3) Degradation, which, as determined by the board will not produce or result in a residue or byproduct which, during or after such process of degrading, would be a hazardous or extremely hazardous waste..."
- Effective January 1, 1980.

3. CONNECTICUT

- Title 22a Section 244(c) - Bans beverage container connectors that do not "decompose by photodegradation, chemical degradation or biodegradation within a reasonable time after exposure to the elements."
- Effective January 1, 1980.

4. DELAWARE

- Title 7 Section 6059 - Bans plastic beverage container connectors "which are not classified as biodegradable or photodegradable by the Department" (of Natural Resources and Environmental Control).
- Effective July 14, 1982.

5. FLORIDA

- Sec. 403.708 - (3) Bans beverage container devices that do not degrade within 120 days; requires distinguishing mark of degradability for easy inspection.
- (4)(a) " 'Degradable,' with respect to any material, means that such material, after being discarded, is capable of decomposing to components other than heavy metals or other toxic substances, after exposure to bacteria, light, or outdoor elements."
- Effective July 1, 1989.

6. IOWA
- HF 2453 - Bans nonbiodegradable or nonphotodegradable beverage container connectors.
- (1)..." 'degradable' - capable of decomposing by biodegradation, photodegradation or chemical process into harmless component parts after exposure to natural elements for not more than 365 days...'biodegradable' - degradable through process by which fungi and bacteria secrete enzymes to convert a complex molecular structure to simple gases and organic compounds... 'photodegradable' - degradable through a process in which ultraviolet radiation in sunlight causes a chemical change in a material."
- Effective July 1, 1989.

7. MAINE
- Title 32, Chapter 28, Section 1868 - Bans beverage container holding devices "which cannot be broken down by bacteria into basic elements."
- Effective January 1, 1978.

8. MASSACHUSETTS
- Title 94 Section 324 - Bans beverage container connectors "which cannot be broken down by bacteria and/or by light into constituent parts."
- Effective January 17, 1983.

9. MICHIGAN
- Public Act #145 - (2) Bans nondegradable plastic beverage container connectors; requires a distinguishing mark to identify degradability; Department of Natural Resources must receive sample of connector and may require data as proof of degradability; vacuum-packed wrapping which completely encases container is exempt.
- 1(b) "'degradable' means capable of being broken down by biodegradation, photodegradation, or chemical degradation into component parts within 360 days under exposure to the elements."
- Effective June 7, 1989.

10. MINNESOTA
- Ch. 685 Art. 26(2) - Bans sale of beverages or motor oil containers held together by nondegradable plastic material.
- Effective July 1, 1989.
- Ch. 688 Art 17 - Bans nondegradable polyethylene beverage container connectors.
- Sec. 1.1(a) "'Degradable' means capable of being decomposed by natural biological processes, including exposure to ultraviolet rays of the sun, within five years after the date of disposal..."
- Effective January 1, 1989.

11. NEW JERSEY
- Title 13:1E-99.2 - Bans beverage container connectors that do not "decompose by photodegradation, chemical degradation or biodegradation."
- Effective April 21, 1986.

12. NEW YORK
- Title 10 Section 27-1011(4) - Bans beverage container connectors that do not "decompose by photodegradation or biodegradation."
- Effective May 27, 1983.

13. OREGON
- ORS 459.850(5) - Bans beverage container connectors "which will not decompose by photobiodegradation, chemical degradation, or biodegradation within 120 days of disposal."
- Effective September 1, 1978.

14. RHODE ISLAND
- Title 23 Section 38(1) et seq. - Bans nondegradable beverage container connectors.
- (1)(b)- "'Degradable material' means material that, upon exposure to natural elements is broken down by biological, chemical, photochemical or other physical processes to a particle size and chemical composition that may be assimilated harmlessly and esthetically into the environment, without leaving a hazardous residue or by-product."
- Effective July 1, 1987.

15. VERMONT
- Title 10, Chapter 53, Section 1525 - Bans beverage container connectors "which are not classified as biodegradable by the Secretary" (of the Agency of Natural Resources).
- Effective July, 1972.

16. WISCONSIN
- 1987 Act 108 to create Section 134.77(3) - Bans beverage container connectors that do not "decompose by photodegradation or biodegradation within a reasonable time after exposure to weather elements."
- Effective date January 1, 1990.

Photodegradation

Research Triangle Institute in Research Triangle, North Ca lina, has been conducting studies on photodegradable Hi-Cone ECO plastic. Although Hi-Cone plastic is positively buoyant and floats in both fresh and salt water, it was feared that the plastic would become fouled with other nondegradable debris at sea, become buried in muck, or become covered with algae and thus not effectively photodegrade. The test results, however, were quite promising and the plastic performed quite well.

During the first week of at-sea exposure of the plastic to sunlight, 70 to 80 percent of the tensile strength of the plastic was lost. If an animal becomes entangled in a yoke during this time period, it very likely could break free from the weakened plastic. After the initial loss of tensile strength, the weakening process apparently slows down considerably. On land, by the end of two months, the plastic had broken down completely (thus

no tensile strength). At sea, it took about 12 weeks for the plastic to nearly break down (with most of the tensile strength lost). Algae did not prevent photodegradation.

Although the ITW Hi-Cone Company has a patent on the engineering design of the six-pack beverage ring and is now manufacturing the photodegradable plastic, other companies could also manufacture the degradable resin, including Union Carbide, Princeton Polymer Labs, Ampacet Corp., and others. ITW is also not committed only to photodegradability.

Another concern involves the controlled lifetime of degradable plastics. The plastic must be manufactured such that there is little chance of premature breakage. Controlled lifetime is not a difficult phenomenon to manage, and by chemically altering the amount of additives to the plastic, controlled lifetimes for plastics marketed in Maine, for example, can be made that are different from those in Arizona.

Biodegradation

The state-of-the-art regarding biodegradable plastics is not as far advanced as with photodegradables. Cornstarch plastic will break down on land but has not yet been demonstrated to do so at sea. Biodegradable beverage rings can be made with starch technology, but such material has not yet been shown to perform adequately either in the soil or in water. More testing and evaluation are thus necessary. The St. Lawrence Starch Company could take on such a task, but ITW's patent on the beverage ring precludes St. Lawrence from testing. The latter will have to come up with a different ring design.

Crops such as corn, sugarcane, wheat, and barley can be fermented to produce high yields of lactic acid. Lactic acid polymers can be made into biodegradable plastic (9). More testing and evaluation are necessary, however.

Chitosan-derived plastic is another novel biodegradable product that has real potential (3), but no one has yet demonstrated that six-pack rings can be made from this material. Tough flexible films of chitosan-derived plastic, with a tensile strength of 20,000 psi, have been cast from dilute acetic or formic acid solutions. The films are virtually impervious to air and water (10). More research and evaluation are also needed here.

Examples of Degradable Plastics

The following are some examples of photo- and biodegradable plastics as well as some of their unique properties:

Photodegradables

Union Carbide manufactures a photodegradable plastic called ethylene-carbon monoxide. In Florida, the plastic may take only 2 weeks to reach the embrittlement stage, and it takes 2-4 weeks to reach the same stage in New Jersey. The plastic completely degrades in New Jersey within 5 months. Controlling the rate of degradation is possible by varying the amount of carbon monoxide that is incorporated into the plastic. The handling, extrusion, and fabrication of the plastic is similar to the process used to manufacture low-density polyethylene (LDPE) homopolymer, but a specially fitted high pressure reactor is needed. The plastic has the same physical characteristics as LDPE and is used notably for six-pack beverage rings. During storage the plastic must be protected from excessive ultraviolet radiation. When it decomposes, the by-products of the plastic are ultimately water and carbon dioxide which do not harm the environment.

E.I. du Pont de Nemours & Co. manufactures a photodegradable polyethylene called Elvax E/CO. Elvax degrades rapidly in sunlight or skylight (i.e., shade). In Fresno, California, in June, Elvax took only 4-5 days to degrade. In Boston, Massachusetts, in September, it took 30 days, and it took 60 days to degrade in Alaska during September and October. In Tennessee, Elvax took 10 days to degrade in March. The rate of degradation is capable of being controlled by varying the level of carbon monoxide incorporation. Elvax's physical characteristics are similar to LDPE. Du Pont has received FDA approval to use up to 30 percent of the copolymer in plastic used as an adhesive layer in indirect contact with food (21 C.F.R.175.105). FDA approval for up to 30 percent for use in direct food contact is pending. The plastic may be stored at 155 degrees Fahrenheit (70 degrees Celsius) for up to 10 months, and glass slows the degradation process by filtering out some light. There is no evidence to show that the dust particles that the plastic breaks down into are biodegradable.

The Ampacet Corporation manufactures a photodegradable plastic known as polygrade. Polygrade's rate of degradation depends upon season and location. Once the reactions have been activated by light, they will continue to occur with heat in the dark. Controlling the rate of degradation is also possible. Polygrade's additive is handled like pigment and can be produced in the same manner as high quality pigmented concentrates for film applications. It should be stored in opaque packaging and is used mostly for mulch films, garbage bags, and millinery bags.

Ecoplastics manufactures a photodegradable plastic called Ecolyte. Degradation of Ecolyte occurs under certain ultraviolet frequency exposures. Sun or skylight is needed to initiate the degradation. Artificial light will not trigger degradation, and glass can filter out the ultraviolet rays of natural light. The same equipment is used to manufacture Ecolyte as is used to manufacture other plastics, and Ecolyte has the same physical characteristics as regular plastic. The plastic breaks down into nontoxic ketone polymers which are reportedly substantially biodegradable by soil microorganisms. The polymers won't migrate so they won't contaminate food if used as packaging, and if they are ingested, they won't pass through the stomach or intestinal walls to infect the body.

Plastopil manufactures a photodegradable plastic called Plastigone. Plastigone can disappear from the environment within anywhere from 3 weeks to 12 months, and the rate of degradation is controllable. Once the degradation process begins, Plastigone will continue to degrade without sun or water. No special equipment is needed to manufacture Plastigone, which is used mainly as a mulch film. The plastic will retain its strength until just prior to degradation, and short sunlight exposure has no effect on the degradation process. Plastigone breaks down into small amounts of metals (nickel, cobalt, copper, and zinc). These metals reportedly have negligible effects on soil, but more research will be needed to determine whether these small amounts of metals are harmful to the environment.

Biodegradables

Imperial Chemical Industries manufactures a biodegradable plastic called PHBV-POLY. The rate of degradation for PHBV-POLY depends upon certain environmental factors. A thin plastic film in sewage may decompose within a matter of days, while a bottle in a landfill may take up to one year to degrade. Conventional plastics technology is used to manufacture the plastic, which has physical characteristics similar to traditional synthetic plastics. As long as the plastic is not stored in a high microbial activity environment it will not degrade in storage. The uses of PHBV-POLY include surgical and orthopedic devices, slow drug release systems, personal hygiene products, packaging, bottles, trays, and cards. When PHBV-POLY degrades, its byproducts are water and carbon dioxide which are nontoxic and nonhazardous and enter the ecosystem safely.

The United States Department of Agriculture is working on a starch based biodegradable plastic film. After a few months the flexible film can lose up to 50 percent or more of its mechanical properties. The degradation rate is controllable by varying the amount of starch that is incorporated into the plastic.

St. Lawrence Group Ltd. also manufactures a starch based plastic called Ecostar. The degradation rate of Ecostar depends on moisture, organisms, temperature, pH, metal salts, the percentage of polymer to active ingredients, the type of polymer, its surface area, and thickness. With 6 percent starch, degrada-

tion may take 3 to 6 years in a landfill. The more starch that is added, the less time the plastic will take to degrade. Additional equipment may be needed to manufacture Ecostar. It is used in food packaging, carry bags, garbage bags, polypropylene binder twine, thermoformed polyethylene and styrene sheets, blow-molded bottles, composting bags, and vinyl wallpaper. The plastic is stable and degrades only in a biologically active environment. It breaks down into water and carbon dioxide which are metabolized by microorganisms.

CONCLUSION

The use of degradable plastic is essential to alleviate the adverse impact of plastic on wildlife. We recognize that degradability is no substitute for the proper disposal of plastic waste. The plastics problem can only be solved ultimately by a combination of efforts including degradability as a critical component in a comprehensive scheme for dealing with plastic waste. Passage of this legislation will show the plastics industry and the general public that Congress considers degradability a viable option in dealing with our massive plastic refuse problem. The language in the bill encourages and allows for the development of new degradability technologies, which through testing and evaluation may ultimately provide even better solutions than our existing ones. We in the Entanglement Network Coalition strongly endorse this legislation and hope the Members of these Subcommittees will do the same.

Representative Studds and Representative Luken, thank you for the opportunity to testify here today. That concludes my testimony. I would be pleased to respond to questions.

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Statement

of

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for

The Society of the Plastics Industry, Inc.

before

The House Merchant Marine Subcommittee on
Fisheries and Wildlife Conservation and the Environment

and

The House Energy and Commerce Subcommittee on
Transportation, Tourism and Hazardous Materials

United States House of Representatives

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The Society of the Plastics Industry Inc. (SPI) welcomes this opportunity to present its views on degradable plastics to the U.S. House of Representatives Subcommittee on the Fisheries and Wildlife Conservation and the Environment.

The Society of the Plastics Industry, Inc. is a trade organization of more than 2000 members representing all segments of the plastics industry in the United States. SPI's operating units and committees are composed of resin manufacturers, distributors, machinery manufacturers, plastic processors, moldmakers, and other industry-related companies and individuals. Founded in 1937, SPI serves as the "voice" of the plastics industry.

To understand SPI's views on degradable plastics, SPI believes it is helpful to review not only the history and current status of the development of degradable plastics, but also where plastics are used, and more importantly which plastics, and why.

Plastic products have been chosen by the marketplace because of their specific and, in some cases, unique physical and/or chemical properties, overall design and performance characteristics, and economics. The imposition of an additional requirement or expectation such as degradability should not be made without considering the impact it would have on the other factors which lead to the choice of a plastic product in the first place. Further, little is known at this time about the ultimate environmental fate of products which degrade in the environment, plastics or otherwise. More research is required

before the use of degradable plastics is more broadly considered. Degradable plastics should be considered only where their use contributes a practical, environmentally sound solution to the problem being addressed.

Plastics is a generic term like "metals". Plastics can be as different from one another as is iron from aluminum or lead from gold. Some plastics are transparent, some are translucent, some are flexible, some are rigid. All are light-weight, inert, resistant to microbial attack and safe in use. Scientists have learned to control the synthesis and thus, within limits, tailor make plastics having unique properties, and with differing costs, needed for various applications.

PLASTICS USE

In 1987, about 66 percent of the 50 billion pounds of plastics sold in the United States were converted to long-life applications in transportation, construction, furnishings, health care, and electronics and other applications. Some of these long-life application markets are potential markets for plastics which have been recycled. The remaining 33 percent were utilized in packaging and other short-life uses. The plastics resins used in packaging consisted of low density polyethylene and linear low density polyethylene (40.8%), high density polyethylene (28.3%), polypropylene (9.9%), polystyrene (9.2%), polyethylene terephthalate or PET (6.5%), and polyvinylchloride or PVC (4%). By application, the principal uses in industrial, institutional and

consumer packaging were flexible packaging, including bags, liners and film (40.4%), bottles, jars and vials (18.9%), containers (17.0%), and all others accounting for 23.7 percent.

Films for wrapping and laminating and for bags are made from all six of the major packaging plastics. In most cases, the choice of plastic used for a particular application is dictated by the application requirements. PVC is used for bloodbags because of its outstanding oxygen barrier properties and compatibility with contents. PET is used in "boil in the bag" pouches because of its barrier properties and higher service temperature requirement. In some cases the combination of physical properties and overall product economics are the major determinants. For example, the change from low density polyethylene to linear low density polyethylene (LLDPE) has reduced the thickness of polyethylene garbage bags by 20%. Further, the LLDPE or high density polyethylene grocery sack represents a savings of 60% by weight over the paper grocery bag with equivalent capacity.

Plastic bottles and containers also are made from the same six plastics. Plastics have become the preferred material for a number of reasons, a principal one being safety. Plastic bottles rarely break on the plant filling line or when dropped by the consumer. Plastic bottles are typically eight to ten times lighter than glass which makes them easier to handle and markedly reduces transportation and energy costs. Again, the choice of plastic used is dictated by the application. Polyethylene is most commonly used because of its toughness, moisture barrier properties, inertness and low cost, and

when transparency is not required. The plastic beverage bottle is made from PET which retains the carbonation; some cooking oil bottles take advantage of the clarity and protection from oxygen provided by PVC. Tough polyethylene pails, carboys and drums have replaced steel as containers for various liquid products, from foods to building products, because of their corrosion resistance and excellent strength-to-weight ratio.

Approximately 10 percent of plastics used in packaging applications is as a coating on other materials, particularly paper. To provide protection from deterioration, paper or metal foil used for packaging is often coated with plastic where there is contact with moisture, grease, oils or chemicals. In food packaging applications, the plastic is the interior food contact surface because of its inertness and compatibility with food stuffs.

SPI believes this brief overview of plastics markets, particularly packaging markets, is necessary to put a discussion of degradable plastics in its proper perspective. Plastics products have been chosen in the marketplace because of their specific, and in some cases unique, physical and/or chemical properties, overall design flexibility, performance characteristics, and economics.

In many cases it is the chemical resistance and durability that make plastics the material of choice. Consideration of an additional performance requirement such as degradability can only be done on an application-by-application basis. Degradability may be a desirable

attribute in agricultural mulch film, but may not be in a shrink film overwrap of a pallet of electronic replacement parts destined for military use in a hot, humid climate. Both applications use polyethylene films, but clearly have different performance requirements.

DEGRADABLE PLASTICS TECHNOLOGIES

It also is useful to review the development of the technology to make certain plastics more degradable. In the late 1960s and early 1970s a good deal of research was directed towards developing plastics with enhanced degradability. (Most plastics are susceptible to degradation when exposed to the ultra-violet (UV) light rays of the sun, albeit at a very slow rate. Most are resistant to biological attack.) These research efforts followed either of two paths, one was to increase the susceptibility to UV, the other was to incorporate biodegradable additives into the plastic with or without additional chemical degradants.

PHOTODEGRADATION

Several techniques for increasing the UV susceptibility of plastics, particularly polyethylene, were developed. One method specific to low density polyethylene is to use carbon monoxide as a comonomer with ethylene during polymer synthesis, thereby, introducing the UV sensitive carbonyl group directly into the polymer chains. This technology is used to manufacture the plastic used to make the photo-degradable ring carrier. The technology is specific to low density

polyethylene and cannot be used to make degradable linear low density polyethylene, high density polyethylene or other polymers.

Another method to introduce photosensitive carbonyl groups into the basic plastic resin is to use a vinyl ketone as a comonomer. This technique has been used to create polyethylene, polypropylene and polystyrene copolymer concentrates which can be blended into plastics of the same type at the 5 percent-10 percent level, thereby making the blend degradable upon exposure to ultraviolet light.

A third approach is the incorporation of photosensitive oxidizing additives into the plastic which "activate" upon exposure to ultraviolet light and degrade the plastic. This approach has been applied primarily to film-grade polyethylene plastics.

BIODEGRADATION

Research on incorporating biodegradable additives into plastics has focused on the use of starch as the biodegradable component. Two approaches have been pursued. One method, developed by the US Department of Agriculture, is to incorporate 40 percent-60 percent gelatinized starch in a blend of neutralized ethylene/acrylic acid copolymer and low density polyethylene. Additional low density polyethylene may be blended into the mixture to improve physical properties while decreasing the degree of degradability. This approach has been used to extrude blown film on an experimental, laboratory scale.

Another approach, also developed in the mid 70's, is to blend starch treated with a coupling agent to provide compatibility, and a small amount of an auto-oxidant such as corn oil in the plastics resin. The starch loading in the finished blend is 5 percent-15 percent of the total. The starch is consumed by micro-organisms upon soil contact. The corn oil reacts with oxygen, catalyzed by metal salts in the soil or added to the plastics, forming peroxides which further degrade the weakened porous plastic. The method has been applied to polyethylene plastics.

One novel approach to manufacturing biodegradable plastics has been the development of a series of poly (hydroxybutyrate-valerate) copolymers. These are fermentation products of a soil microorganism grown on a mixed sugar and fatty acid feedstock. A comparable product, polyhydroxybutyrate homopolymer, has been investigated by many researchers over the years since first characterized in 1925. Poor production processes, very poor temperature stability and generally poor physical properties hindered market development of the homopolymer. However, recent advances in fermentation techniques and product recovery technology led to the patenting and market entry of the copolymers in the early 1980s. Although commercially available, the copolymers are extremely expensive relative to commodity plastics and are definitely still in the developmental stage.

In June 1987, the SPI sponsored a Symposium on Degradable Plastics at which papers discussing all of the above mentioned technologies were

presented. The Proceedings have been shared at an earlier hearing with Chairman Studds. SPI has recently issued a call for updates to its Symposium Proceeding but no new technology has yet been reported. That does not mean that the industry has not been active however.

At the recent National Plastics Exposition in Chicago, a triannual trade show for the plastics industry sponsored by SPI, several companies promoted their proprietary versions of degradable polymers. In a novel development one company is promoting a product which combines the photosensitive oxidizing additive technique with the starch/auto-oxidant technique for use in polyethylene films. Another company, which is developing the vinyl ketone copolymer concentrate, is currently seeking a "non-additive" clearance from the US Food and Drug Administration for use in food contact applications.

Further, it has recently been reported in the trade press that a major U S polyethylene resin producer has completed a production plant trial of blow molded plastic bottles utilizing a starch modified polyethylene resin. Lengthy (and costly) product performance trials are being conducted to determine the acceptability of the product.

However, all these recent developments do not necessarily promise that the age of degradable plastics is around the corner. The American Society for Testing and Materials (ASTM), a major independent, third party standards making organization, has established within its plastics committee, a subcommittee to develop standard methods to evaluate the degradability of plastics. SPI is helping in that

endeavor. The subcommittee has recognized the lack of generally accepted procedures for determining degradability.

The recently published "Report of the Interagency Task Force on Persistent Marine Debris" devoted an entire chapter to the assessment of degradable plastics technologies. The report, too, recognized the lack of standards for measuring plastics bio-and photodegradation. The report recommends that the National Bureau of Standards work with ASTM to develop standards. It should be noted that there are no standards for evaluating the degradability of alternative products. If degradability is deemed to be a desirable attribute, all products should be evaluated for degradable performance.

The Interagency Task Force Report also identified a number of important unanswered questions about the current state of the technology such as rate of degradation, especially vis-a-vis aesthetic impacts; effects on entanglement hazards; the effect of the marine environment on the degradation process; and the environmental impact of the products of degradation. The report recommends that EPA, FDA and NOAA work with the industry to elucidate these environmental impacts. It is appropriate at this point to note that the EPA has a Congressionally mandated study currently underway addressing plastics in the solid waste stream, with a particular emphasis in degradable plastics, their benefits and the associated environmental effects. This report is expected to be issued by June 1989.

A recent report by the Congressional Research Service identifies many of the same uncertainties regarding the development of degradable plastics.

CONCLUSION

The use of degradable plastics should be considered only if it contributes a practical, environmentally-sound solution to the problem being addressed. For example, photodegradation does respond, at least partially, to the problems encountered when a product is littered. Photodegradables can reduce the persistence of litter, thereby reducing the long-term unsightliness and entanglement hazards associated with litter. Photodegradation should be considered for those items which have a high potential for becoming litter. It should be noted, however, that the rate of degradation is highly dependant on the amount of ultraviolet light the product receives. Therefore the rate is somewhat seasonal and geographically dependant.

In the same manner, biodegradables may address litter, but it is not at all clear what role these materials should play, if any, in an integrated solid waste management system. Degradation is, in fact, a complex and slow process. Many materials generally regarded as degradable deteriorate either slowly or not at all; for example, studies conducted for EPA indicate that over 60 percent of the materials currently being landfilled are considered to be degradable (food wastes, yard wastes, paper and paperboard, etc.) yet there is a landfill shortage. Decomposition of paper is significantly retarded

if it is coated or heavily printed. For example, newspaper print can be read easily after ten years in a landfill.

Recycling or the recovery of the fuel value through waste to energy systems would appear to be more beneficial solid waste management techniques.

In summary, it is clear that interest in developing degradable plastic products has been rekindled. Degradable plastic products will find their niche in satisfying appropriate environmental and marketplace needs. Our industry is one that has thrived on product innovation and satisfying marketplace needs. However, SPI believes that much more product development, performance evaluation, and environmental study must be completed before further major strides can be taken.

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Chairman
Sub. On Fisheries & Wildlife
Conservation & The Environment
HZ-531 HOB, Annex 2
Washington, D. C. 20515

Dear Mr. Chairman:

As you know, the sources of plastics pollution in our ocean environment are widespread and increasing. I am personally very concerned about the magnitude of the problem along the Georgia coast in my own Congressional District.

I deeply appreciate your own leadership on this issue and the fact that the Subcommittee on Fisheries and Wildlife Conservation and the Environment will soon be considering S. 1986, addressing the problem of six-pack plastic ring containers. I understand that the bill as marked up by the Senate on May 13 could lead to the requirement that all plastic six-pack ring containers be made of degradable materials within two years.

A review of the floor statement of Senator Chafee, author of the Senate bill, shows that the legislation is intended to exempt those plastic devices which "do not contain an enclosed hole or circle of more than 1 3/4 inches in diameter" because such small holes are not associated with the problem of seabird or marine entanglement. (A copy of that statement is attached hereto.) Should the Subcommittee's review indicate that this is the case, then I accordingly urge that the Subcommittee include this specific exemption in the legislation.

I appreciate your consideration of these views and respectfully request that my statement be entered into the record of the proceedings regarding this matter. Thank you for your time and attention.

Sincerely,

Lindsay Thomas
Member of Congress

PLASTIC POLLUTION CONTROL ACT OF 1987

Mr. BYRD. Mr. President, I ask unanimous consent that the Senate proceed to the immediate consideration of Calendar Order No. 513.

The PRESIDING OFFICER. The clerk will report.

The assistant legislative clerk read as follows:

A bill (S. 1986) to study, control, and reduce the pollution of aquatic environments from plastic materials, and for other purposes.

The PRESIDING OFFICER. Is there objection to the present consideration of the bill?

There being no objection, the Senate proceeded to consider the bill.

AMENDMENT NO. 1976

Mr. THURMOND. Mr. President, I ask that amendment No. 1976 be reported by the clerk.

The PRESIDING OFFICER. The clerk will report.

The assistant legislative clerk read as follows:

The Senator from South Carolina (Mr. THURMOND), for Mr. CHAFEE, proposes an amendment numbered 1976.

Mr. THURMOND. Mr. President, I ask unanimous consent further reading of the amendment be dispensed with.

The PRESIDING OFFICER. Without objection, it is so ordered.

The amendment is as follows:

Strike out all after the enacting clause and insert in lieu thereof the following:

FINDINGS

SECTION 1. The Congress finds that—

(1) plastic ring carrier devices have been found in large quantities in the marine environment;

(2) fish and wildlife have been known to have become entangled in plastic ring carriers;

(3) non-degradable plastic ring carrier devices can remain intact in the marine environment for decades, posing a threat to fish and wildlife; and

(4) eleven States have enacted laws requiring that plastic ring carrier devices be made from degradable material in order to reduce litter and to protect fish and wildlife.

DEFINITIONS

SEC. 2. As used in this Act, the term—

(1) "regulated item" means any plastic ring carrier device which is made, used, or designed for the purpose of packaging, transporting, or carrying multipackaged cans or bottles, and which is of a size, shape, design, or type capable, when discarded, of becoming entangled with fish or wildlife; and

(2) "naturally degradable material" means a material which, when discarded, will be reduced to environmentally benign subunits under the action of normal environmental forces, such as, among others, biological decomposition, photo-degradation, or hydrolysis.

REGULATION

SEC. 3. Not later than 24 months after the enactment of this Act (unless the Administrator of the Environmental Protection Agency determines that it is not feasible), the Administrator of the Environmental Protection Agency shall require, by regulation, that any regulated item shall be made of naturally degradable material, which, when discarded, decomposes within a period established by such regulation. The period within which decomposition must occur after being discarded shall be the shortest period of time consistent with the intended use of the item and the physical integrity required for such use. Such regulation shall allow a reasonable time for affected parties to come into compliance, including the use of existing inventories.

The PRESIDING OFFICER. The question is on agreeing to the amendment.

The amendment (No. 1976) was agreed to.

The PRESIDING OFFICER. The bill is open to further amendment. If there be no further amendment to be proposed, the question is on the engrossment and third reading of the bill.

The bill was ordered to be engrossed for a third reading, was read the third time, and passed, as follows:

S. 1986

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

FINDINGS

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Mr. BYRD. Mr. President, I move to reconsider the vote by which the bill was passed.

Mr. THURMOND. I move to lay that motion on the table.

The motion to lay on the table was agreed to.

Mr. CHAFEE. Mr. President, I am very pleased the Senate has approved S. 1986, as amended, a bill reported by the Committee on Environment and Public Works. This legislation will require that plastic six-pack yokes be made from degradable materials, a requirement which 11 States have already adopted.

I would like to note, Mr. President, that this bill, as amended, has been fully cleared with the chairman of the Committee on Environment and Public Works, Senator BURDICK, and the ranking member of this committee, Senator STAFFORD.

Also, the Society of the Plastics Industry, the major group representing the industry, has reviewed this legisla-

tion and has indicated that it has no objections to its passage.

Last December the Committee on Environment and Public Works reported the Plastic Pollution Control Act of 1987, Senate bill 1986. The purpose of this bill was to implement the provisions of an international convention for the prevention of pollution from ships, commonly known as Marpol annex V, and to study, control, and reduce the pollution of aquatic environments from plastic materials.

I was very pleased when the majority of provisions in S. 1986, including provisions relating to Marpol annex V, elements of a New York Bight restoration plan authored by Senator LAUTENBERG, and a major study of plastic recyclability and degradability, were included in a bill sent to the Senate from the House of Representatives. This bill, H.R. 3674, was passed by the Senate and signed into law by the President, becoming Public Law 100-220.

Over the past decade there has been a growing concern among conservationists and scientists over discarded plastic in our Nation's waters and on land. Entrapment in plastic debris such as six-pack holders, packing bands, lost or discarded fishing nets, and ingestion of plastic materials is known to kill thousands of birds, sea lions, turtles, seals, and fish each year.

The plastic pollution problem has grown to such a point that we cannot walk to our Nation's beaches and parks without encountering plastic litter. Beach cleanup efforts in some States, including Rhode Island, have resulted in the collection of many thousands of discarded plastic products.

Public Law 100-220 takes a giant step toward eliminating plastic waste in the environment: Marpol annex V will make it illegal for ships operating in United States waters to discard plastic overboard, and the Environmental Protection Agency will take a serious look at ways to reduce plastic pollution in the environment. In particular, EPA will consider recycling and degradability as methods for reducing plastic in the solid waste stream and reducing plastic litter, especially in the marine environment.

However, Mr. President, one provision in S. 1986 as reported by the Environment Committee was not included in the House bill due to jurisdictional concerns between committees in the House of Representatives. This provision relates to a requirement that plastic six-pack holders be made from degradable materials.

This legislation will require the Administrator of EPA to require that six-pack holders be made from naturally degradable materials. The Administrator would be given 24 months to issue a regulation, and would allow a reasonable time for affected parties to come into compliance, including the use of existing inventories.

Mr. President, as I stated earlier, 11 States, including my own State of Rhode Island, have banned the sale of nondegradable six-pack holders. Other States include Connecticut, Delaware, Maine, Massachusetts, New York, New Jersey, Oregon, Vermont, California, and Alaska. Degradable six-pack holders are actually made from photo-degradable materials which, when exposed to sunlight, become brittle and break down into microscopic pieces. Industry has indicated that it can meet the demand nationwide for degradable six-pack holders. Since the technology exists, and is already in use in several States, it is no longer necessary to see six-pack holders littering our beaches and parks and entangling birds and sea lions.

I am under no illusion that approving this legislation will solve the problem of plastic debris in the environment. Six-pack holders constitute only a small portion of the total amount of plastic in the solid-waste stream. However, passage of this bill will send a strong and important message: That degradability is a viable option, and is one part of the solution to the plastic waste problem.

I thank my colleagues for supporting this much-needed and overdue legislation.

The remainder of my statement will further clarify the intent of this legislation. The legislation will require EPA to issue a regulation requiring that any plastic ring carrier device which is made, used, or designed for the purpose of packaging, transporting, or carrying multipackaged cans or bottles, and which is of a size, shape, design or type capable, when discarded, of becoming entangled with fish or wildlife be made of naturally degradable material which, when discarded, decomposed within a period established by such regulation. Only plastic ring carriers should be covered by this legislation. Not included for regulation are plastic devices which do not contain an enclosed hole or circle of more than 1¾ inches in diameter or which do not contain a hole.

For the purposes of this legislation "naturally degradable material" means a material which when discarded will be reduced to environmentally benign subunits under the action of normal environmental forces, such as, among others, biological decomposition, photo-degradation, and hydrolysis.

The EPA shall issue this regulation no later than 24 months after the date of the enactment of this act, unless EPA determines that it is not feasible, or that by requiring this regulation significant harm may result to human health and/or the environment, including harm to fish and wildlife.

Regulated items should decompose in the shortest period of time consistent with the intended use of the item and the physical integrity required for such use. The regulation should allow a reasonable time for affected parties to comply with the regulation and will allow sufficient time for affected parties to use existing inventories.

STATEMENT OF THE NATIONAL SOFT DRINK ASSOCIATION

BEFORE A JOINT HEARING OF THE HOUSE SUBCOMMITTEES ON

FISHERIES, WILDLIFE CONSERVATION AND THE ENVIRONMENT AND

TRANSPORTATION, TOURISM AND HAZARDOUS MATERIALS

RE: SENATE BILL 1986

JULY 26, 1988

The National Soft Drink Association welcomes the opportunity to submit a statement on S. 1986, a bill which would require the Environmental Protection Agency to promulgate regulations within 24 months to require all 6-pack ring carriers to be composed of material which is photo-, bio-, or hydro-degradable. NSDA is the national trade organization of the United States soft drink industry. Approximately 72% of the 1162 soft drink manufacturers are active members of the association. In addition, the vast majority of soft drink licensors who manufacture the concentrates and/or syrups from which soft drinks are made belong to NSDA. Our members account for more than 92% of the soft drinks produced annually in the United States.

The soft drink industry has utilized the plastic ring carrier as a convenient and cost effective method of multi-packing soft drink cans for over 25 years. This type of packaging is used by this industry throughout the United States. At present, 17 states require these devices to be degradable.

The soft drink industry shares the concerns of the Congress and the public about the quality of the environment. NSDA, however, believes that this type of single-issue legislation is an unwarranted intrusion into the marketplace and should more appropriately be considered in the content of the entire solid waste problem. This legislation addresses only a small segment of the plastics market, which itself constitutes only a small fraction of the total solid waste stream. It would seem to NSDA that the Congress should consider the larger context of solid waste management in next year's reauthorization of the Resource Conservation and Recovery Act.

However, if the Congress chooses to enact this legislation, NSDA believes the Environmental Protection Agency (EPA) should consider the following issues in determining the feasibility of implementing regulations requiring plastic ring carriers to be made of naturally degradable material:

- the ability of plastic manufacturers to supply users of plastic ring carriers with current and projected future needs;
- the costs associated with converting from non-degradable to degradable plastic ring carriers;
- the length of time plastic carrier users need to exhaust current inventories;

- the effects of degradable plastic ring carriers on current recycling programs;
- realistic degradability time frames.

The soft drink industry is gradually moving toward universal use of degradable plastic ring carriers and will eventually arrive at the point for which this legislation aims. Such a goal would be accomplished on a realistic, and not a forced, time-frame.

Our industry has demonstrated its commitment to improving the quality of the environment. A variety of programs is currently in place to recover soft drink packaging. In addition, the industry has supported Keep America Beautiful (KAB), Beverage Industry Recycling Programs (BIRP), and state and local litter reduction programs. NSDA is prepared to work with the Congress in developing a comprehensive approach to solid waste management for the Nation.

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